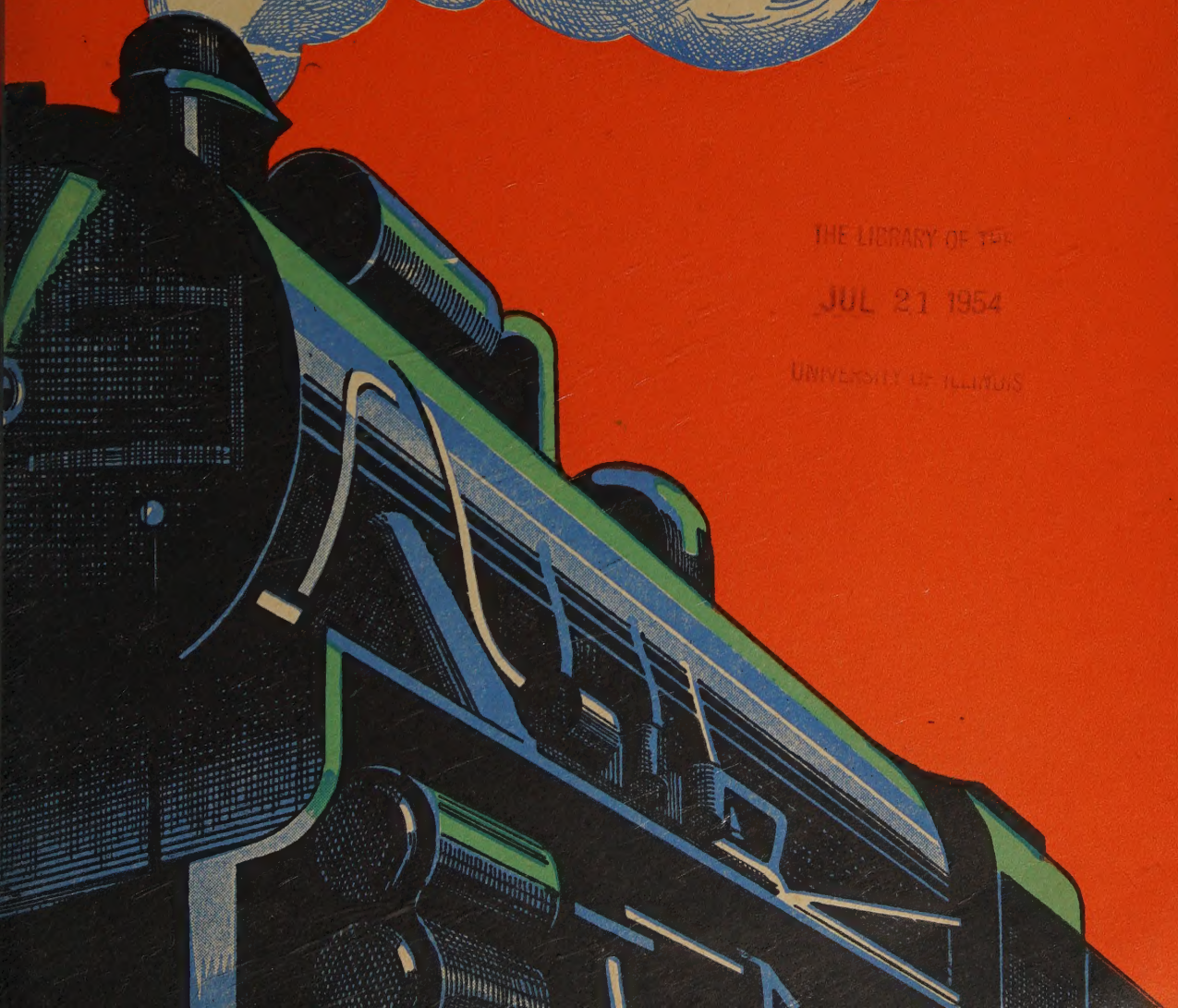
VOL. XXXI. — No. 6. JUNE 1954.

Monthly Bulletin of the International Railway Congress Association

(English Edition)



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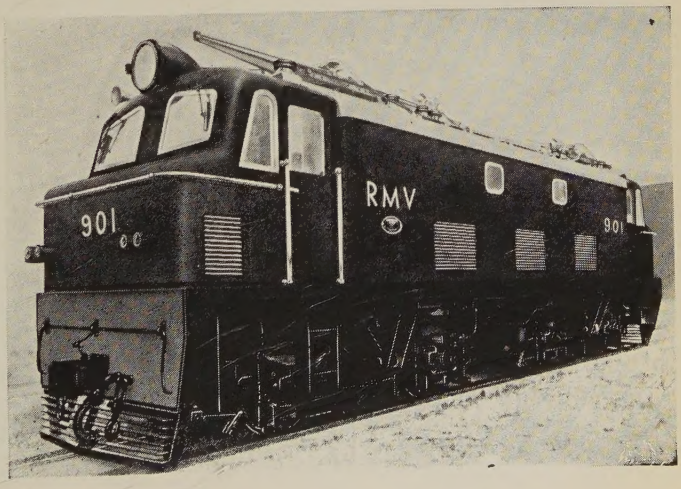

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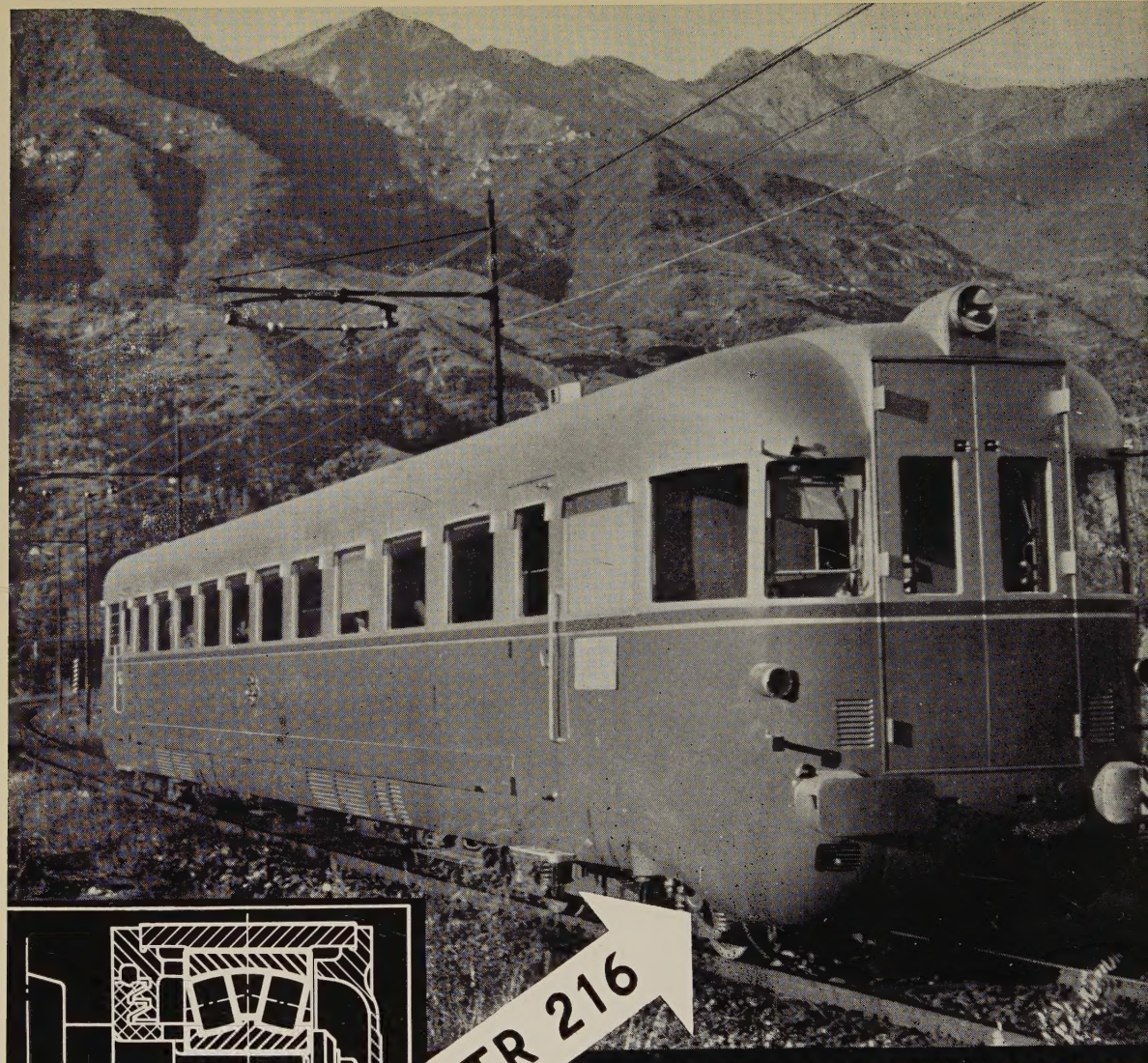

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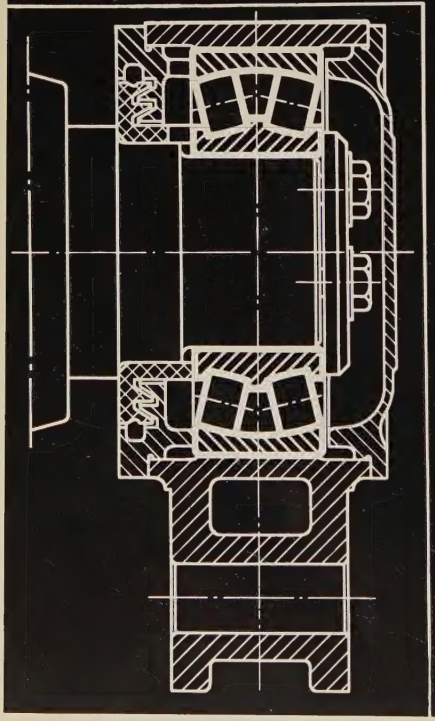

RAILWAY JOURNAL AXLE-BOX

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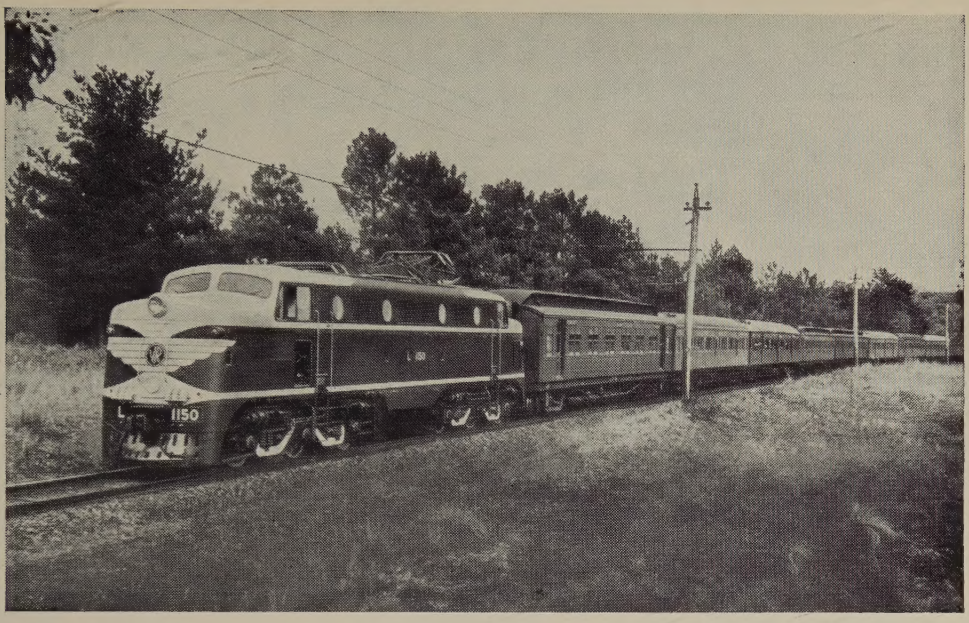
New motive power for Victorian Government Railways



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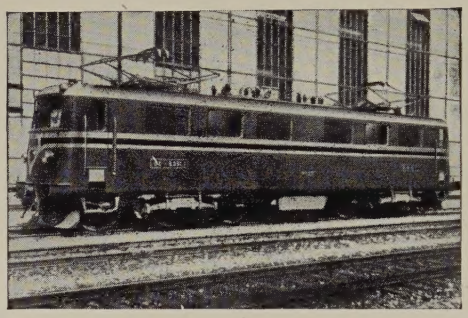

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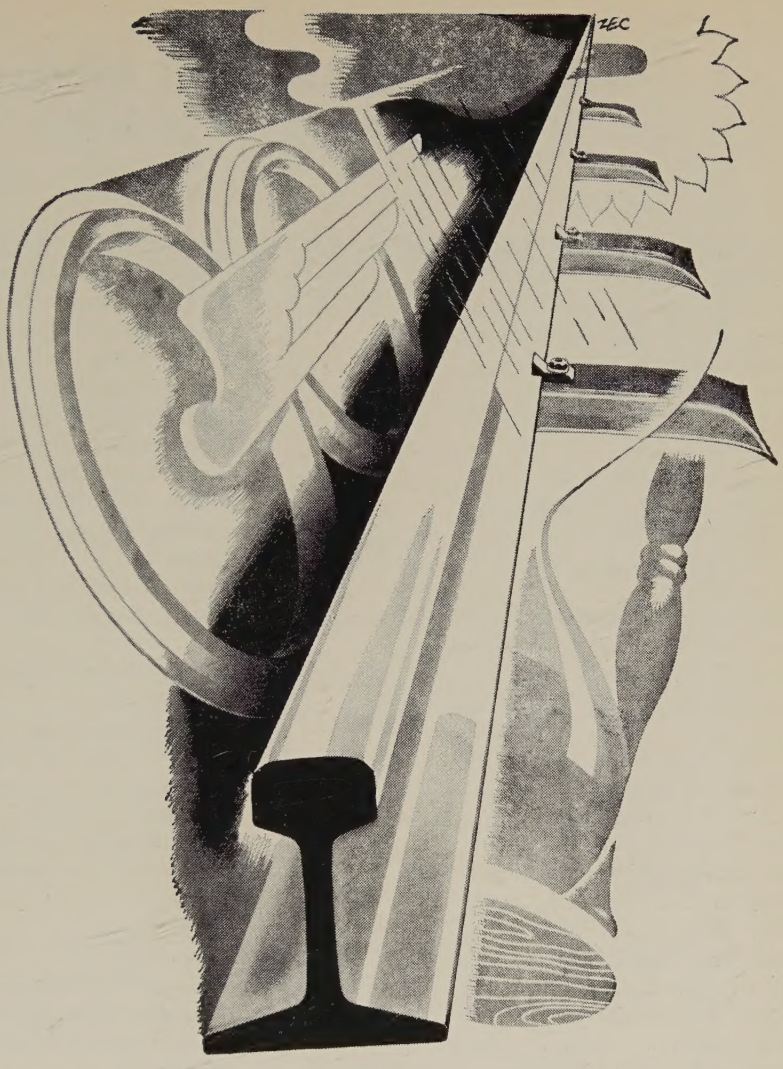

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MONTHLY BULLETIN

OF THE

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

(ENGLISH EDITION)

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BULLETIN
OF THE
INTERNATIONAL RAILWAY CONGRESS
ASSOCIATION
(ENGLISH EDITION)

[656. 224 (42)]

British Railways and their passenger traffic,

by C. R. WADE,
Assistant (Passenger), British Transport Commission.

During the year 1952, British Railways (i.e. the railways of England, Scotland and Wales, excluding the lines controlled by the London Transport Executive and certain minor lines outside the nationalised system) earned £111 881 000 in gross receipts from nearly 989 million journeys made by passengers travelling on their lines.

Figures, impressive though they may be, are in themselves somewhat dull unless one knows something of the story that lies behind them. The record of the railways is one of effort and achievement in the expansion of the social and industrial life of a country whose population has grown since the opening of the first railways from less than 20 millions to some 50 millions today and of service and sacrifice throughout two major wars. Volumes would be needed to tell the full story of the growth of Britain's transport system and it is only possible, in a brief article, to touch upon some of the « highlights ». It may be of interest, however, to follow the trend in the development of the railways and of their competitors in the field of passenger transport and to see what British Railways are doing to meet the changing needs and circumstances of the present day.

Railways.

In order to overcome the prejudice with which their projects were greeted, the early railway companies were forced to submit to many burdensome restrictions and obligations, either contractual or statutory. In fact, throughout their existence, the activities of the railways have been governed by legislation designed to guard the public against the exploitation of a monopoly in transport.

They had, moreover, to face up to excessive prices for the land they required and, in addition, to bear heavy legal costs. There was no difficulty in raising all the capital needed for the vast expenditure on track, stations, etc., in the 19th century — nor generally in paying a return to the investors — but the high level of capitalisation was later to prove a serious embarrassment when net revenues were shrinking because of increased costs and outside competition.

In spite of all obstacles, however, the railway system grew rapidly and, in due course, there followed a process of amalgamation which led to the creation of the railway system broadly as it still

existed at the outbreak of the 1914-1918 war. By this time the railways had introduced extensive arrangements for interworking and co-ordination which greatly increased the facilities for the travelling public (as, for example, the introduction of through services from London to Scotland via both east and west coast routes) whilst through fares were generally available throughout the country.

The early years of the twentieth century saw the railways confronted by problems arising from increased costs of operation and growing demands for improved wages. Of even greater import, however, those years also saw the birth of outside competition in the development of the internal combustion engine as a means of propulsion for road vehicles and aircraft. Few people realised, when the first motor cars, 'buses and aeroplanes made their appearance, that they were the forerunners of vast organisations which, in a relatively short time, would seriously challenge the supremacy of the railways, but from those early beginnings there grew the network of road and air services which today extends to all parts of the country. At that time the advent of the motor 'bus meant little more than a revolution in the spheres of municipal transport where it gradually supplanted the horse-drawn 'bus or the electric tram although some of the railways themselves, notably the Great Western, Great Eastern and North Eastern, had powers to operate road motor services and did, in fact, maintain fairly large fleets of vehicles. Their activities, however, did not go beyond providing local tours for holiday makers, or « feeder » services to link more remote villages and towns with their railways and there was no thought of substituting road services for rail nor of carrying passengers by road for more than relatively short local journeys.

So we find in 1913, the last of what one might term the « normal » years they were to enjoy, that the railways were still reasonably secure in their monopoly of passenger transport and their returns showed a satisfactory position. Passenger journeys, which amounted to some 650 millions in 1876, had increased to 1 550 millions whilst net revenue had risen from approximately £29 millions to over £45.2 millions.

On the outbreak of war in 1914, the railways came under government control and throughout the war years they were strained to the utmost limit with the result that they emerged with depleted resources to face serious arrears of maintenance and a growing burden of wages and operating costs.

So serious was the position that the Government ordered an enquiry by a select committee and ultimately a new chapter in railway history was opened by the passing of the Railways Act of 1921 under which 123 existing railway companies were rearranged into four main groups, the Great Western Railway, London & North Eastern Railway, London Midland & Scottish Railway and Southern Railway. This amalgamation was designed on a geographical basis and as a result, although there was some unavoidable overlapping, broadly, each of the new companies assumed throughout control as from 1st January 1923 of recognised main routes and streams of traffic — the Great Western Railway to Wales and the West Country; the Lon-

don & North Eastern Railway to the Eastern Counties and eastern side of the country to Scotland and through the Midlands to south Lancashire; the London, Midland & Scottish Railway through the Midlands and North West to Scotland; and the Southern Railway to the South East, South and South West. One of the most important results of amalgamation from the passengers' point of view was that the co-ordination of services and the opening up of new through services and routes were greatly facilitated. In addition, of course, the way was paved for economies in costs of operating and administration, which it was hoped would eventually redound to the benefit of the user.

The Act provided that for each of the companies there should be ascertained a « Standard Revenue » and that standard charges — both passenger and freight — should be fixed at levels calculated to yield that revenue, with efficient management. A Railway Rates Tribunal was set up to determine the charges (the overall level being stabilised at approximately 60 % above that of 1913/1914) and, subsequently, to modify them as necessary to enable the railways to earn their standard revenues. The revision of charges under the Act was an enormous task, however, and it was not until 1927 that the Standard Revenue was ascertained and the standard charges were not introduced until 1928.

Unfortunately for the railways, events had already outrun the provisions of the 1921 Act and the tide was turning against them. Although the immediate post war years saw substantial increases in their gross revenue — due partly to increased charges and partly to the heavy traffics during the boom years following the war — these were more than offset by rises in wages and costs of materials coupled with the growing effect of road competition, with the result that the Standard Revenue was never attained before the second world war broke out. Wages, which were admittedly low before the war, had increased by as much as 114 % and, although in later years the cost of living (which rose in 1920 to as much as 176 % above 1914) fell appreciably, the level of wages did not go down in proportion despite small reductions applied by agreement with the Railway Unions between 1931 and 1937. The serious effect of this is clearly illustrated by the fact that, after deducting costs of materials and miscellaneous charges, the proportion of the gross receipts which was absorbed by wages and salaries rose from 51 % in 1913 to 75 % in 1931.

Mounting wages and costs of operation, however, were not the only problems the railways had to face during the years between the wars. They suffered a serious setback in the general strike of 1926 and later they had to endure the effects of the economic crisis during the years 1930 to 1934, with its acute trade depression and high level of unemployment; and all the time the network of road services, established in the immediate post-war years, was steadily extending and competition was becoming more and more intensive. It was, in fact, nourished to a large extent on the very circumstances which were so adversely affecting the railways. The slump in industry and trade resulted in a serious increase in unemployment — the total reached a peak of nearly 3 millions in

1932 — and a shortage of money which, for a long time, limited the ability of many people to travel at all, or, if they did travel, impelled them to seek the cheapest means.

How serious was the effect of all these factors on the railways is clearly seen from the following table :—

Year.	Index of Business Activity.	Unemployment (at July) (Millions)	Passenger Receipts. £. Millions.	% of 1929.
1929	100	1.2	62.0	100
30	94	2.0	58.9	95.0
31	89	2.8	54.2	87.4
32	85	2.9	50.9	82.1
33	90	2.5	51.1	82.4
34	97	2.2	52.3	84.3
35	101	2.0	53.8	86.7
36	107	1.7	55.8	90.0
37	113	1.4	58.7	94.5
38	106	1.9	58.6	94.5

Despite their diminishing profits the railways expended vast sums on renewals and improvements in their track and equipment and during the years 1928-1938 no less than £240 millions were devoted to such projects as the renewal of permanent way, the widening of lines, modernisation of stations and depots, renewal of rolling stock, electrification, etc., some of which were also designed to assist in relieving the national unemployment problem. The result was that when war again broke out in 1939, the railways were well equipped for their task.

On the outbreak of war the railways again came under Government control which continued until Nationalisation on 1st January, 1948, under the provisions of the Transport Act, 1947, opened a new chapter in railway history.

Before looking at the changes brought about by Nationalisation, however, brief mention should be made of the developments which had occurred in connection with transport undertakings — both rail and road — operating in the London Area. The London Passenger Transport Act of 1933 set up an authority named the London Passenger Transport Board which acquired the undertakings of the London Underground railways, the Metropolitan Railway and the tramway and stage carriage services of municipal authorities and road firms so far as they operated in London and within a defined area around London. The operations of the main line railway companies were not immediately affected by this amalgamation, although later they entered into « pooling » arrangements in respect of their passenger traffic within the area.

Under the Transport Act, 1947, there

was constituted the British Transport Commission to which were transferred the entire undertakings of the four main line railway companies and of the London Passenger Transport Board, as well as those of specified inland waterways.

The Act laid upon the Commission the duty of securing the provision of an efficient, adequate, economical and properly integrated system of inland transport and port facilities for passengers and goods which, as a whole, would pay its way taking one year with another, and to this end they were empowered to acquire road transport undertakings, both passenger and freight. To assist the Commission in the discharge of their functions, there were set up a number of public authorities known as « Executives » to whom were delegated the administration and control of the various sections of the Commission's undertaking, namely :— the Railway Executive, the London Transport Executive, the Road Transport Executive, the Docks & Inland Waterways Executive and the Hotels Executive.

The hotels and catering interests of the railway companies were transferred to the Hotels Executive, their docks and canal interests to the Docks & Inland Waterways Executive and their interests in road haulage to the Road Transport Executive (later renamed the Road Haulage Executive).

The Railway Executive consisted of a Chairman and six full-time and two part-time Members, each of the full-time Members undertaking specific functional responsibilities assisted by departmental Chief Officers and Executive Officers. The commercial responsibilities for both passenger and freight traffic rested upon the Commercial Member.

The systems of the former railways together with a number of minor lines acquired by the Commission were reformed into six Regions, namely :

London Midland Region : Comprising the former L.M. & S.R. in England and Wales.

Western Region : Comprising the former G.W.R.

Eastern Region : Comprising the lines of the former L. & N.E.R. south of Leeds and Doncaster.

North Eastern Region : Comprising the lines of the former L. & N.E.R. north of Leeds and Doncaster to Berwick.

Scottish Region : Comprising the former L.M. & S.R. and L. & N.E.R. lines in Scotland.

Southern Region : Comprising the lines of the former Southern Railway.

There have since been a number of adjustments in the Regional boundaries, as for example, the transfer of the London, Tilbury & Southend Line from the London Midland Region to the Eastern Region.

For each Region there was appointed a Chief Regional Officer, who was responsible for the general administration of the Region, within the policy laid down by the Executive, and for the co-ordination of the work of the Regional Departmental Officers, but the latter officers were responsible to and were directed by the appropriate Functional Members of the Railway Executive.

In the Regions, commercial matters arising from transport by rail or on ferry vessels and lake steamers were covered by the Commercial Superintendents and, under them, the District Commercial Officers. In the case of steamship traffic, the commercial responsibilities rested

upon the Continental Superintendent in the Southern Region and the Continental Traffic Manager in the Eastern and North Eastern Regions for the continental services; the Irish Traffic Superintendent for Irish services : and the Manager (Clyde Shipping Services) for services on the Firth of Clyde.

The operating responsibilities for both rail and steamship services fell upon the Operating Member of the Railway Executive whose regional organisation was similar to that of the Commercial Department.

The Transport Act provided for a Transport Tribunal to be set up in place of the Railway Rates Tribunal and laid down that the Commission should proceed with the preparation and submission to the Tribunal of new schemes of charges to which reference will be made later.

The « functional » organisation remained in operation until 1953 when Parliament passed another Transport Act which provided, inter alia, for the reconstitution of the British Transport Commission and a revision of its responsibilities and duties; for the abolition of the Railway Executive and the submission of a scheme of reorganisation of the Railways (except those of the London Transport Executive) under which there would be a substantial delegation of authority.

The Railway Executive ceased to exist after 30th September, 1953, and, pending the introduction of the new scheme of organisation required by the Act, an interim organisation came into effect as from 1st October, 1953, under which the Commission assumed control of policy and finance and the general direction of the railways. To assist the Commission in the direction of policy, in the settlement of urgent regional matters and in securing a common line of action in matters of principle there were appointed a number of officers, including, for Commercial matters, a Chief of Commercial Services.

The Chief Regional Officers (redesignated Chief Regional Managers) were given responsibility for management over all departments in their Regions (subject to the financial and policy control of the Commission) and the departmental officers became responsible to them. The organisation within the Regions remains unchanged.

Railway fares.

Whilst many of the Acts, under which the early railway companies were formed, laid down the maximum rates per mile which could be charged for the conveyance of passengers, the companies were free to charge — and did in fact charge — within those maxima, such fares as they considered appropriate. No uniform practice was followed, however, and as a result there grew up a structure of ordinary fares and season ticket rates showing wide disparities as between one company and another, whilst many anomalous fares were introduced to influence traffic to competitive routes. The first step towards the establishment of common scales was the fixing of standard charges under the Railways Act, 1921 but even this did not remove all the anomalies since the railway companies undertook that fares and

season ticket rates below the standard would not be increased by more than a certain amount.

Under the provisions of the 1921 Act there was laid down a scale of fares for Workmen for whom, under various enactments, the railways had to provide cheap fares in certain circumstances. Although the term « Workmen » was broadly defined as « Artisans, Mechanics and Labourers » it proved impossible to distinguish between them and other passengers and, as a result, any passenger was able to obtain Workmen's tickets during the normal hours of issue.

In addition, there has grown up, within the framework of the ordinary fares, an extensive system of reduced fare facilities, the most important of which are the wide range of excursions, cheap-day and other fares designed to encourage travel by rail and to counter road competition. Of these the outstanding was the Monthly Return (first introduced as a weekend and then as a Holiday Return Fare) which, at approximately two-thirds of the ordinary return fare, virtually ousted the latter from public favour for period return journeys. Other concessions in fares for parties or individuals were granted for reasons of business and recreation or on compassionate grounds.

In fulfilment of the obligations imposed on them by the Transport Act 1947, the British Transport Commission sought and secured the approval of the Transport Tribunal to three schemes of charges. The first, which came into force on 1st October, 1950, applied to the London Area (roughly a 40 mile radius from the centre of London) and was designed to assimilate fares of the Railway Executive and the London Transport Executive, to adjust substandard fares and to replace Workmen's fares which, in view of the greatly increased level of wages, had become an anachronism, by a system of Early Morning Return fares (third class) available to all passengers.

The second scheme, which came into force during 1952, provided for a reduction in the Railway Executive's third class ordinary fares from the current rate of 2.44d per mile to 1.75d per mile (with authority to go up to 2d per mile as from 1st January, 1953); for a reduction in First Class fares from 66 $^{2}/_{3}$ % to 50 % above third class and for the adoption throughout the country of a standard Season Ticket scale and an Early Morning Return scale, Workmen's fares being entirely displaced.

The introduction of a third class ordinary fare of 1.75d per mile meant not only an appreciable reduction in the cost of single journeys but the abolition of the Monthly Return fare (which was on a somewhat higher level) and certain concessional fares on the same basis, whilst first class travel became substantially cheaper.

So far as British Railways were concerned the main effect of the third scheme (which came into force on 16th August, 1953) was to fix the *maximum* third class single fare at 2d per mile and to replace the scales of Season ticket Rates and Early Morning Return fares laid down in the 1952 scheme by new *maximum* scales on a slightly higher basis.

The new main fares structure of British Railways now is :

Ordinary Single Fare : 3rd class — 1¾d per mile; 1st class — 50% above 3rd class.

Tickets are available for 3 days and break of journey is allowed.

(NOTE : 2nd class fares, which are issued only on certain boat train services, are 25% above 3rd class).

Ordinary Return Fare : Double the single fare, 1st or 3rd.

Tickets are available for 3 months and break of journey is allowed.

(NOTE : 2nd class fares, which are issued only on certain boat train services, are double the 2nd class single fares).

Season Tickets : Issued for periods of from 1 week to 12 months.

First class rates 50% above 3rd class.

Third class rates :

Weekly : range from 4/6 for a distance of 1 mile to 57/- for 75 miles (maximum).

One Month : range from 16/3 for 1 mile to £18-2-9d for 250 miles plus 6d per mile thereafter.

Three Months : Three times the monthly rate less 10%.

Six Months : Double the 3 monthly rate.

Twelve Months : Double the 6 monthly rate.

Early Morning Return : Third class only. Issued between any stations not more than 60 miles apart by trains arriving at destination not later than 8.0 a.m. with some exceptions.

The rate per mile tapers with the distance down to less than ½d per mile for journeys of 60 miles.

Excursions : Normally 3rd class at specially quoted fares ranging from 1¼d per mile down to slightly over ½d per mile.

Where 1st class fares are applied they are 50% above 3rd class.

Cheap Day : First or third class. Fares vary from approximately 1¼d down to about ¾d per mile.

Other Cheap Fare facilities : Various concessions for single or return journeys at fares related to the single fare.

(*NOTE* : Except in the case of Early Morning Return tickets and certain cheap fare facilities children of 3 years and under 14 years of age are charged half the adult rate).

Passenger business.

Having seen something of the present bases of fares charged by British Railways and their background let us look briefly at the traffic carried at those fares. The following table shows, for each category, the number of passenger journeys making up the 1952 total of 988 997 000 and the proportion of the takings which accrued :—

	Number of Journeys.	Percentage of total Journeys.	Percentage of total Takings.
Ordinary Fares and Monthly Return Fares	190 754 000	19.3	51.1
Excursions, Cheap Day, etc.	265 094 000	26.8	15.2
Other descriptions of reduced fares. . . .	48 060 000	4.9	16.8
Early Morning Return and Workmen. . .	206 878 000	20.9	6.0
Season Tickets.	278 211 000	28.1	10.9
	988 997 000	100.0	100.0

These figures (which, as mentioned earlier, exclude the traffic of the London Transport Executive) clearly show the important part played by facilities of one kind or another, at fares less than the ordinary fares, which accounted for more than 80 % of the total journeys made on British Railways during 1952.

Season Ticket travel made the largest contribution to the number of journeys at 28 % (more than half of which arose in the London Area) but produced only 10.9 % of the takings, whilst Early Morning and Workmen's journeys accounted for over 20 % of the journeys and only 6.0 % of the takings.

Passengers paying full fares (or Monthly Return fares before they were withdrawn in May 1952) made less than 20 % of the total journeys but contributed over 50 % of the takings.

Excursions, Cheap Day and other reduced fare facilities together produced nearly 32 % of the passenger journeys and 32 % of the takings. These facilities are playing an increasingly important part in the development of new business and are of real value in that they make it possible to secure the fullest use of rolling stock and accommodation which is surplus to the requirements of full fare-paying traffic. It is obvious, of course, that such reduced fares must be so designed that they attract an additional volume of traffic sufficient, after allowing for the cost of carrying and for any diversion of passengers from higher fare categories, to increase the net revenue.

One outstanding feature of rail passenger traffic is the decline in the number of first class journeys which, in 1952, represented slightly more than 2.0 % of the total. At one time, before the railways began seriously to develop third class travel, the first and second class passengers were all-important and it is recorded that even as late as 1866 they respectively accounted for about 25 % and 34 % of the total journeys. Improvements in the standard of accommodation and services for third class passengers brought about a marked change and, by 1923, first class passengers accounted for only about 4.7 % and second class for less than 2.1 % of the total.

The rapid development of the private car — and particularly the introduction of low priced models — the serious trade depression of the early 1930's and the further improvement of third class accommodation to counter the effects of 'bus competition all contributed to bring the volume of first class travel steadily down to about 3.7 % in 1938, whilst second class had disappeared entirely except on certain boat train services.

During the recent war, first class accommodation was abolished on London suburban services so that the maximum use might be made of seating capacity and has only gradually been restored — in fact many of the services are still « third class only ». The effect of this, coupled with increases in the level of fares, the tightness of money in the years since the war and growing air competition, has been to reduce still further the number of first class passengers and the proportion fell from 3.0 % in 1947 (the year before nationalisation) to slightly above 2.0 % in 1952 despite the fact that the second Charges Scheme brought a reduction in the level of first class ordinary fares from about 66 $^{2}/_{3}$ % to

50 % above third class and a reduction in the latter from 2.44d to 1.75d per mile — a saving which it was not unreasonable to hope would attract more people to first class travel.

The question has inevitably been asked in recent years whether the railways are justified in continuing to provide first class accommodation and it is interesting, therefore, to look briefly at some of the considerations involved.

The seating capacity of a first class coach is less than that of a comparable third class vehicle so that, if there were only one class of travel, equal in all respects to the present third class standard, a smaller number of vehicles would be necessary to carry the existing volume of traffic. There would be savings, therefore, in the costs of construction and maintenance and, to some small extent, in train working and shunting. There is, however, a large stock of vehicles with superior class accommodation and until their working life had expired — which will not be for many years — the full benefits of the economies could not be attained.

Turning to revenue : first class fares are 50 % higher than third class and in 1952 the number of first class journeys was 21.5 millions, the takings amounting to £11.4 millions or about 10 % of the total. Assuming that the volume of travel remained unchanged, the abolition of first class travel would mean, therefore, a loss of revenue amounting to 33 1/3 % or £3.8 millions. In order to maintain the same level of takings, it would be necessary to secure 50 % (or nearly 11.0 millions) more journeys in the corresponding third class fare categories. This is, of course, purely an arithmetical calculation taking no account of the effect such a course might have upon the goodwill of the first class passengers. There is likely always to be a demand from those who can afford to pay the price for a greater degree of comfort and convenience and people accustomed to the higher standards of first class accommodation would not take kindly to an involuntary transfer to third class. It is probable that in this event, many would make as much use as possible of air transport or private motor cars, thus still further reducing revenue.

So far the railways have not considered it politic to do away with first class travel facilities but, obviously, it is uneconomic to provide and haul such accommodation on services where it is unproductive. It is possible, therefore, that if the downward trend persists, the railways might be forced to discontinue the provision of a superior type of accommodation on all services except those on which there is a real demand, i.e., main line and « business » services. In this event, serious thought would have to be given to the method of charging. Would it be better to continue the existing system of first class fares, based on a higher rate per mile, or to abandon it in favour of a system of « unclassed » fares (i.e. the equivalent of the present third class) with supplementary charges for the use of the superior accommodation ? Either course would give rise to administrative problems.

In the meantime, the railways have to seek to maintain a balance between supply and demand in determining the proportions of first and third class seats

to form the various train sets and in compiling their carriage building programmes.

Passenger road transport.

The numerous small passenger transport businesses which sprang up after the first world war were content, in the first place, to undertake only local or relatively short distance services but it was not long before they turned their attention to routes which took them further and further afield. In the absence of proper control over their operations it followed that, not merely did they enter into competition with the railways, but there ensued struggles for supremacy within the industry, accompanied by the inevitable fare cutting. Many smaller operators were put out of business — or sold their interests to stronger competitors — and there emerged major concerns backed by substantial assets and firmly established in recognised spheres of operation. Eventually, these companies were absorbed under powerful controlling organisations, the foremost of which were Scottish Motor Traction Ltd., who, with their Associated Companies, served virtually the whole of Scotland outside the four main cities; British Electric Traction Ltd., and Thomas Tilling Ltd., whose companies between them covered most of England and Wales.

The expansion of road passenger transport proceeded apace under the most favourable circumstances. There were no costly buildings to maintain at every stopping place — even today there are comparatively few 'bus stations or shelters — and the tracks were provided by the taxpayers of whom, ironically enough, the Railway Companies were amongst the highest contributors. Against this, the railways, at their own cost, have had to provide expensive tracks and signalling installations which, with their stations, must be maintained to a high standard of efficiency. As far back as 1932, it was estimated by a committee, set up by the Minister of Transport, that railway track costs, corresponding to those provided by public Authorities for road users, in 1930 amounted to no less than £64 millions. In short, the road operator, unburdened by enormous capital charges, has always enjoyed conditions which permitted him to charge fares substantially below those of the railway companies, a potent factor at a time when unemployment was high and spending capacity of the individual was low; moreover, in fixing their fares, the road firms, unlike the railways, who apply a common rate per mile throughout almost the whole of their system, could take into account any special circumstances such as the nature of the country in which they operated or the existence of a parallel service, and so we find varying rates per mile in different parts of the country.

Changing economic and social conditions in the country also lent themselves to the development of road passenger transport but it became evident that the absence of control over its expansion was not in the best interests of either the country or the road companies themselves and, eventually, there was passed the Road Traffic Act of 1930. This Act, which later was amended and amplified by the Road Traffic Act, 1934,

represented the first attempt to regulate road passenger transport. Under it there were set up Traffic Commissioners — later redesignated Licensing Authorities — to whom operators have to apply for licences to introduce new stage carriage, express or excursion services. Other interested parties, including the railways, have the right to lodge objections if they so desire. The applications and objections are heard in public and, after considering all the circumstances, the Authority announces a decision. Either side has the right of appeal to the Minister of Transport against a decision. The circumstances which a Licensing Authority should take into account when considering an application are defined as being the extent to which the proposed service is necessary or desirable in the public interest, the needs of the area as a whole in relation to traffic and the co-ordination of all forms of transport, including rail.

Hitherto « need » has generally been interpreted as the *need* for a road service in the public interests as distinct from a *demand* for that service, based on the desire to secure cheaper transport even though adequate services — albeit possibly at higher fares — were already available. The provisions of the Act in respect of « need » are of particular interest at the present time as there have been clear signs of late that not only Licensing Authorities, but the Minister of Transport also, are placing a much wider interpretation on the term and are taking into account the relative fares by rail and road in making their decisions.

The Act affords a degree of control over fares by providing also that applicants for services shall submit their proposed schedules of fares for the approval of the Authority.

This legislation has been of the utmost importance in that it not only checked uncontrolled and wasteful development in the road passenger transport field but it gave a measure of protection to the railway companies and to other road operators against unrestricted competition. In one respect, however, it has largely failed to achieve its object, namely, in the control of « private » or « contract » hire operations for which it is not necessary to hold service licences. True, the Act does lay down certain conditions to govern operations of this kind but, unfortunately, it has proved most difficult to ensure observance of these conditions, despite the efforts of the Licensing Authorities, and infringements are widespread. Private and Contract hire operators engage mainly in catering for excursions and outings by parties and competition in this field is intensive.

As already mentioned, unlike ordinary rail fares for which a national basis is laid down, there is no uniformity in the basis of road fares, each company being free to compile its fares according to the circumstances on the route or in the area where it operates; nor is there a common practice in the level of return fares, some operators charging double the single fares whilst others make a reduction. On some routes — particularly those to seaside resorts — there are even differences in the level of fares in the winter and summer services, those on the latter usually being appreciably higher.

True, there have been set up a number of Regional Fares Committees of road

operators who review fares matters and make recommendations to the Licensing Authorities but this machinery has not produced standard bases of fares for adoption throughout the country.

And now, what did the Railway Companies do to meet the threat of road transport ? Bear in mind that they had enjoyed an almost complete monopoly since they came into being. The Municipal undertakings, which, of course had been operating for many years, did not count seriously as competitors and the first people to enter into competition were ill-equipped, and could offer only limited facilities. Perhaps it can be understood that there was some hesitation at first to regard the threat as serious or to take drastic steps to meet it. However, the effect on their receipts soon became such that the railways could not ignore it and, as their vulnerability at that juncture lay, primarily, in their higher charges, the first step in countering the efforts of their road competitors was to introduce regular cheap-day tickets — both first and third class — between places where severe competition was being experienced and these, together with extensive excursion facilities which were progressively introduced in later years, have continued to form the backbone of their resistance, with considerable success. At the same time, special attention was paid to train services. Many high speed trains were put on and improved rolling stock was introduced.

In 1929 the railway companies were granted general powers by Parliament to operate their own road services or to acquire interests in existing companies and, thereafter, they secured substantial, but not controlling, interests in the companies belonging to Scottish Motor Traction Ltd., British Electric Traction Ltd., and Thomas Tilling Ltd., with the right to make nominations to the boards of directors. Under agreements with these companies, there were set up Standing Joint Committees for the purpose of co-ordination and consultation on matters of mutual interest as a result of which many local arrangements were introduced for the benefit of the travelling public, e.g., interavailability of tickets and calls by 'bus services at railway stations.

On the nationalisation of railways under the Transport Act, 1947, the Railway Companies' interests in these concerns passed to the British Transport Commission who subsequently, under the powers conferred upon them by the Act, acquired the interests of Thomas Tilling Ltd., and Scottish Motor Traction Ltd., in the companies in their groups which thus came under the control of the Commission. The operation of the two groups was placed in the hands of the Tilling Group Management Board and Scottish Omnibus Group. Since then the Commission have acquired a number of smaller road companies but the B.E.T. companies (although associated) remain outside the B.T.C. organisation.

The acquisition of the Tillings and S.M.T. companies has opened the way to a greater degree of co-ordination with the railways to which end there is close liaison between the two sides at all levels of administration. It also enabled the Commission to embark on the preparation of the first « Area Passenger Transport Schemes » in fulfilment of its obligations under the Act to provide a « pro-

perly integrated system of public inland transport ».

The picture has now changed however as the Transport Act, 1953, not only cancels the obligation to provide an integrated system of transport (and the preparation of area schemes) but it also deprives the Commission of its powers to acquire further passenger road transport undertakings and gives the Minister power to direct them to dispose of their controlling interest in those undertakings they have already taken over.

Air transport.

The development of the aeroplane for commercial purposes proceeded apace after the 1914/18 war but, for some time, attention was devoted mainly to overseas services, the expansion of internal routes by the few companies who were operating being hampered by the dearth of suitable aerodromes.

In 1929, the Railway Companies, foreseeing the future importance of this mode of transport and no doubt having in mind their experience with road competition, obtained powers to operate both internal and continental air services and in 1934, after experimental services had been started on a number of routes, they formed a company styled Railway Air Services Ltd., in association with Imperial Airways Ltd. Thereafter the services were progressively expanded and other operators taken into partnership until, at the outbreak of war in 1939, the Air Companies associated with the railways were operating about 80 % of the route mileage authorised for internal air operators.

During the war, Railway Air Services Ltd., and certain of their associated companies operated those civil air services which were indispensable and by the end of 1944 they carried over a quarter of a million passengers and covered more than six million aircraft miles.

In 1944, with a view to future development and co-ordination, the Railways submitted to the Government a plan to form, in partnership with shipping companies and independent air operators, a new company to provide a comprehensive network of air services within the United Kingdom and to the Continent which they were prepared to operate without a subsidy.

The Government, whilst accepting the main principles of the plan, made counter proposals for the constitution of the new company but neither scheme came to fruition as the Socialist Government which assumed office in 1946 rejected the proposals and, instead, passed the Civil Aviation Act under which there was created a nationalised body — British European Airways Corporation. Railway Air Services Ltd., and other companies associated with the railways continued to operate as agents for B.E.A. until 1947 when they were entirely taken over.

Although, originally, B.E.A. had the right to develop and operate internal services as required, « charter » firms and other independent operators being permitted to provide services only under licence, it is now the policy of the Government to encourage private enterprise in air transport and accordingly B.E.A. as well as independent operators must secure the authority of the Minister

of Transport and Civil Aviation to develop new services.

Vast sums have been expended since the war upon the development of aircraft, the extension of air routes and the provision of suitable civil airfields. There is no doubt — although it is not possible to measure the loss — that the business built up by the air companies has been secured largely at the expense of the railways. B.E.A. alone carried 486 203 passengers on internal routes in the year ended March, 1952 (as compared with 361 311 in the year ended March, 1948) whilst their international services catered for nearly 659 000 passengers in the same period, thus seriously affecting both rail and shipping receipts of the railways. It is not unreasonable to assume that, in the absence of air services, the majority of these people would have used railway-owned services and would have paid first class fares.

Rail travel undoubtedly has advantages in that fares generally are lower — particularly when the cost of transport to and from the airports is taken into account — and the services are much more reliable since they are not so seriously affected by weather conditions. It must not be overlooked, however, that the air companies are following the policy of cutting their fares on routes where there is a substantial volume of regular business to be tapped. Air travel, moreover, has the attraction of greater speed for which many are prepared to pay, notably the holiday maker and the business man, each of whom — though for different reasons — is anxious to spend as little of his time as possible in travelling.

So far the loss to the railways has been mainly on long distance routes where the time required to travel to and from the airport is not so appreciable a factor but developments in the use of helicopters and landing grounds in or near the centres of the main towns may well bring shorter distance traffic into the field of competition.

The position of the railways vis-a-vis the air companies is entirely different from that in relation to road operators in that they have no statutory right to make representations against the introduction of new air services which will be harmful to their interests. We have, therefore, the anomalous position of a nationalised air transport concern (subsidised by the State) competing with the nationalised railways which receive no subsidy and have no remedy other than such measures as they themselves can devise. General reductions in rail fares could not be made without a serious loss of revenue but there remain the possibility of substantial acceleration of services coupled with the provision of attractive amenities on the trains, to both of which close attention is being paid.

It is interesting to note that although there is no statutory provision for co-ordination, nevertheless, in the interests of the travelling public, the railways have continued with B.E.A. certain mutual arrangements which were first introduced in the days of Railway Air Services. For example, air tickets can be booked at certain railway stations whilst inter-availability arrangements are in force under which a passenger who holds an air ticket may transfer to rail or vice versa.

The decision of the Government to amalgamate the Ministries of Transport and of Civil Aviation may, possibly, lead to some change in the policy so far as air transport is concerned and so alter the circumstances in which air and rail transport have to compete.

What British Railways are doing.

Now let us see what measures British Railways are adopting to repair the effects of wartime conditions and to develop new business — in short, to consolidate their position in passenger transport.

One of the most important of their activities is in the field of relationship with the public. Apart from announcements made from time to time by Members or Officers of the Commission, the day-to-day responsibility for informing the public on the policy and achievements of British Railways or of explaining the problems with which they have to contend, rests, primarily, with the Public Relations organisation. We are more concerned, however, with the closer commercial relationship between British Railways and their customers.

In these days of intensive competition, it is of the utmost importance in the development of their passenger business that the railways maintain close touch with the travelling public to ascertain their needs, to give them all possible help in planning and arranging their journeys and to encourage them to travel by rail.

Broadly, one might regard these contacts as falling into two categories, « personal » and « impersonal ». The personal contact can be subdivided again, first into that where members of the public, usually individuals or small parties, who contemplate or have decided upon making a journey, come to the railways for advice and information as to trains, amenities and fares. These find ready help at the Station Master's Office or Enquiry Office at any station, at the numerous British Railways Town Offices and Agencies in the larger towns or at any headquarters or district Commercial Office.

The second form of personal contact is that where British Railways themselves take the initiative and, for this purpose, in addition to the day-to-day liaison maintained with their customers by their Officers and Agents, they have created from the diverse organisations of the former Railway Companies, a unified organisation of experienced Railway Service Representatives under the control of the District Commercial Officers. Each representative has allotted to him a specified territory in which it is his responsibility, on behalf of British Railways as a whole, to maintain regular touch with firms and organisations of all kinds in the course of whose activities passenger travel may arise or be developed either as individuals or in groups for business, pleasure or recreation.

The development of party travel forms an important part of the representatives' activities and to help in this they deliver lectures and addresses on rail travel facilities using for the purpose of illustration films and film strips produced by the Films Section of the British Transport Commission. A striking illustration of the results that can be achieved by close and active representation of this kind is provided in the case of Women's

Institutes, for whose members one Region alone arranged in 1952 no less than 73 special trains to carry 23 000 members on day outings to various parts of the country.

In addition to their organisation in Great Britain, British Railways have their own offices and Agencies in many parts of the world where intending visitors to this country can readily obtain information and help in arranging their journeys and, if they wish, can buy their tickets and reserve accommodation in advance.

Finally, before passing on to the « impersonal » contact, it should be mentioned that British Railways provide and staff Enquiry stands at most of the principal trade, agricultural and other Shows and Exhibitions throughout the country. For many of these shows they provide their own portable offices. They also operate a novel mobile enquiry office, which has been used to tour holiday resorts during the summer months.

The « impersonal » approach takes the form of publicity for rail facilities in either general or specific terms, through the medium of advertisements in the national and local press or in trade, sporting and other journals; by means of posters exhibited at stations and on thousands of sites throughout the country and on the sides of parcels delivery vans; or by handbills and literature — such as the timetables, holiday guides and pamphlets describing popular day outings. Effective use is also made of window displays in the offices of Ticket and Travel Agents and of British Railways' own Town Offices.

It is of no avail, however, to set up an efficient sales organisation unless the wares they have to sell are attractive and British Railways have spared no effort, not only to make good the ravages of six years of war but to add to their range of facilities in order that the traveller by rail may enjoy the highest standards of comfort and convenience at economic prices.

Train services.

The former railway companies were justifiably proud of their « crack » trains such as the « Flying Scotsman », « Silver Jubilee », « Coronation Scot » and « Cornish Riviera » and of the high standards of speed and punctuality of their services in general but their schedules had to be abandoned during the war and at the end of hostilities the railways were confronted with the enormous task of overtaking the arrears of maintenance of their track and stock before they could hope to return to anything approaching pre-war standards.

On the nationalisation of the railways the responsibility for this fell upon the Railway Executive and, despite difficulties arising from shortage of materials and staff, such progress has been made that average speeds are now approaching pre-war standard. For example, trains on the West Coast route from London to Scotland now attain point-to-point speeds up to 90 miles per hour whilst, on the East Coast route « The Elizabethan » (introduced in Coronation year) runs non-stop between London and Edinburgh doing the journey of 393 miles in 6 3/4 hours which is faster than its counterpart in pre-war days. In fact, train services generally have been vastly improved in spite of periods of inade-

quacy of coal supplies and a much higher standard of punctuality has been attained. A process of rationalisation has been followed, particularly in residential services on Saturdays, which, owing to the extension of the five-day week, were poorly patronised and a number of lightly loaded trains have been withdrawn. The total mileage operated each week during the summer period of 1953 was 4.3 millions and during the winter of 1953-1954, 3.8 millions.

Many services, both local and long distance, have been reorganised to give departures at even times on or past the hour whilst additional trains have been put on for the convenience of business men travelling between London and large provincial centres to enable outward and return journeys to be made in one day. Other improvements in the facilities for the travelling public, especially during the holiday season, include many new through and cross-country services and the arrangements for some main line trains to call at selected suburban stations outside London to save passengers having to make their way to and from the London termini.

In addition to the normal train services and the large programmes of excursions, British Railways run many special boat trains to connect with ocean liners at the principal ports such as Southampton, Liverpool and Plymouth. In 1952 the number of such trains was nearly 2 250.

The main line services in the summer of 1953 included no less than 18 all Pullman car trains on Saturdays, 16 on other weekdays and 14 on Sundays (more than in the 1939 schedules) whilst the number of sleeping car trains ranged from 47 on Saturdays to 68 on Fridays, the days of lowest and highest demand. Refreshment facilities in the form of restaurant car, buffet car or Pullman car services were available on over 700 services each weekday except Saturdays when the number rose to nearly 830. Even on Sundays, with the reduced train services, over 500 trains had facilities for refreshments.

After exhaustive investigation into developments in diesel traction, and following a series of tests with light-weight units in normal traffic working, British Railways are embarking on wide scale experiments with multiple unit diesel trains to replace or supplement steam passenger services on a number of lines. The first area to be served will be in the West Riding of Yorkshire, to be followed by services on lines in West Cumberland, Lincolnshire, East Anglia, between Glasgow and Edinburgh and between Newcastle and Middlesbrough.

Tests are also being made with a number of diesel-electric and gas turbine locomotives on normal traffic working in main line passenger services on two of the Regions.

British Railways are not neglecting the possibilities of electrification. The Southern Region's electrified lines in the southern suburbs of London and the main line routes to Portsmouth, Brighton and other places on the South Coast form the biggest network of suburban and inter-suburban electric railways in the world. Other suburban areas of London are also served by electrified lines, including that from Liverpool Street to Shenfield which was completed in 1949, whilst the electrification of the busy and

difficult main line between Sheffield and Manchester is progressing steadily. British Railways have plans for the electrification of the London, Tilbury & Southend line which daily handles a dense business and residential travel to and from London and approval has been given to proposals to extend the electrified area from Shenfield to Chelmsford and Southend.

Carriages.

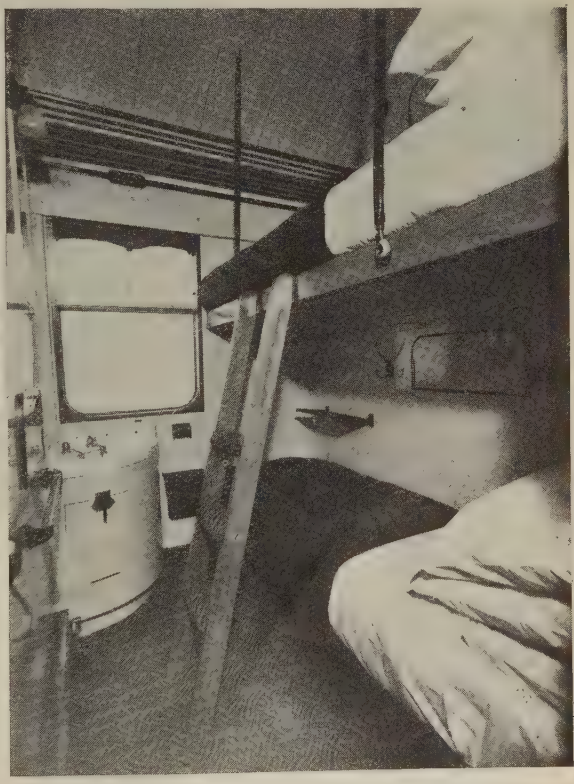
Owing to the rigours of wartime conditions and to enemy action, the stock of passenger vehicles in 1947 was almost 3 000 less than in 1938 and this loss has been a serious handicap to the railways. Shortages of materials have impeded new building but, nevertheless, British Railways have pushed ahead as rapidly as possible with their programmes and at the end of 1952 the total stock stood at almost 42 000, comprising over 40 000 coaches, 760 restaurant cars and more than 400 sleeping cars and providing nearly 2 ½ million seats and berths. At the same time the opportunity opened up by the unification of the railways has been seized and new standard designs have been prepared for passenger vehicles which can be used on main lines throughout the country. Many of these carriages, which are of all-steel construction and afford the highest standard of comfort and convenience, have now come into service.

A new standard design of third class sleeping car (illustrated fig. 1 and 2) has also been introduced which provides a much greater degree of comfort and seclusion for the third class passenger. Each coach has double berth compartments equipped with full bedding and wash basins with hot and cold water, pressure ventilation and individual reading lamps.

Refreshment accommodation has not been neglected and new restaurant cars and kitchen cars — both first and third class — as well as buffet and other types of refreshment car are being brought steadily into service.

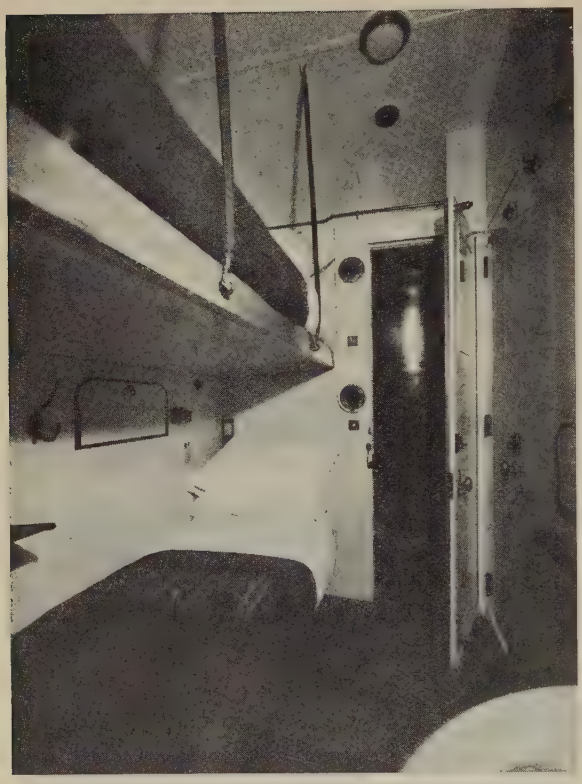
Seat reservations.

The arrangements made by British Railways for the reservation of seats contribute greatly to the comfort and con-



Photograph by British Railways.

Fig. 1. — 3rd Class Sleeping Berth.



Photograph by British Railways.

Fig. 2. — 3rd Class Sleeping Berth.

venience of the traveller. For the modest sum of 1s. 0d. (which, incidentally, is the same charge as before the war) a seat can be reserved from the starting point on most long distance trains as well as on many other services. An intending passenger can book his seat as early in the year as he wishes without being required to purchase his rail ticket in advance and to do this he has only to call at or write to the Reservation Office at the station from which the train starts or enquire at any British Railways Town Office, or Ticket Agency. Alternatively, his local Station Master will attend promptly to a request to arrange a reservation.

Seat Reservation facilities have now been extended to some 1 180 trains on Saturdays, when the heaviest service is in force, and 826 on other weekdays, and their popularity is clearly shown by the fact that 4 ½ million reservations are made annually.

Sleeping berths.

Sleeping cars with both first and third class accommodation are conveyed on many night trains between London (King's Cross, Euston and St. Pancras stations) and places in Scotland, via both east and west coast routes, and in the North and North West of England : from London (Paddington) to South Wales and the West Country.

Berths may be reserved at the Reservation Offices at the departure stations or at any station on British Railways.

For the holiday maker.

The extension throughout industry of holidays « with pay », coupled with the high level of employment, has made it possible for very many more people to go away for an annual holiday — in fact it is estimated by the British Travel & Holidays Association that fully 50 % of the adult population now do so. For these, as well as for the many thousands of tourists who come from the Continent and overseas, British Railways offer a number of attractive facilities.

During the summer months, « Holiday Runabout » tickets are available at exceptionally low rates in practically all

Fig. 3. — Camping Coach — Exterior View.

Photographs by British Railways.

Fig. 4. — Camping Coach — Living Room.

holiday districts. The holders of these tickets can travel as often as they like over the routes specified on the tickets and, if they wish, they can obtain cheap tickets for dogs or bicycles for the same areas and periods.

For those who desire a camping holiday, but wish to be spared the more spartan conditions of living « under canvas » a novel solution of their problem lies in the « Camping Coach » (fig. 3 and 4). British Railways have provided

118 of these coaches and placed them at selected sites around the coast and in particularly attractive inland districts in England, Wales and Scotland. Each coach provides sleeping accommodation for six to eight persons, a comfortable living room and a fully equipped kitchen, together with all the necessary equipment such as crockery, cutlery, towels and bed and table linen.

Camping Coaches are available from April to October at very low rentals ranging from £5-15-0d. to £12-10-0d. per week according to the period of booking, and the size and location of the coach. They may be hired for a maximum period of two weeks, a condition of letting being that adult ordinary fare rail tickets, to the number of not less than four in the case of a six berth coach and six in the case of an eight berth coach will be booked from the hirer's home station. The demand for this type of holiday is so great and the accommodation was so heavily booked for the 1953 season that additional coaches are being provided for 1954.

In addition to Camping Coaches, there are a number of Camping Apartments at stations which have been closed to passenger traffic, where the station buildings have been converted and equipped for the purpose.

The touring holiday has grown in popularity during recent years and British Railways, in collaboration with the principal Travel Agents have arranged a series of 8 and 15-day « All in » tours to Scotland, at charges which — as the description implies — include hotel accommodation, meals on the special trains and attractive tours by road and water during the holiday.

An innovation for the summer of 1953 (which is being repeated in 1954) was the introduction of 8 and 15-day excursion bookings by special trains in each direction between London and Glasgow and Edinburgh at a return fare approximately 40 % below the ordinary return fare. These trains (known as « Starlight Specials ») leave on Friday nights on the outward journey, arriving at their destinations on Saturday mornings, the return journeys being made on the Saturday night, eight or fifteen days later. Advance booking is necessary and passengers are thus assured of a seat in each direction. Refreshment facilities are provided on each train.

For the individual who decides to remain at home for his holidays and spend his days on outings, there are available a wide range of cheap day tickets, excursions (day, half-day or evening) as well as numerous specially planned day tours.

Excursions, parties and day outings.

Since the beginning of the present century there has been a striking expansion of communal activity in social, recreational or sporting spheres. This gathering together of people in pursuit of their collective interests has opened up a wide field for the development of travel for which British Railways offer many attractive facilities to parties, both large and small, as well as to individuals.

Small parties of 8 adults or more, who travel together in both directions, can

obtain, by prior arrangement, cheap tickets valid for the day of issue at the ordinary single fare plus 50 % whilst for larger parties, cheap excursion fares are quoted for travel by ordinary train services, or if the numbers are large enough, special trains are run.

British Railways are always anxious to help the organisers of excursions, not only with suggestions as to the venues of their outings but with all the incidental arrangements for their enjoyment. They will make arrangements for meals on the trains or during the course of the outing, for tours by road or water, for visits to places of interest or entertainment — in fact, every possible assistance is given in planning and arranging all details of the trip. Outings by firms' employees are a feature of excursion travel and some idea of the detailed organisation that is involved can be gleaned from the fact that for the annual outing of one firm alone, British Railways provide no less than 11 special trains to carry over 5 000 people.

The organisers of parties of 25 and upwards are allowed free tickets according to the size of the party, and in the case of « guaranteed » excursions they receive, in addition, a commission on the gross receipts amounting to 7 % for a day excursion and 5 % for a half-day excursion.

Not the least popular amongst the outings arranged by British Railways are visits by members of model railway clubs, train spotters or schoolboys to railway workshops, marshalling yards or locomotive depots and many educational excursions for scholars are arranged in conjunction with schools or education authorities.

Quite apart from the numerous organised excursions for which they provide, British Railways also offer a wide range of cheap excursion facilities for the individual both by special trains (« speculative » excursions) or by ordinary trains in connection with sporting or other events, to seaside resorts or to places of special interest. Football matches alone call for an enormous number of excursions during the year; to take only one example, the final of the competition for the English Football Association Cup on 2nd May, 1953 attracted a gathering of over 90 000 people, of whom no less than 22 000 were brought from all parts of the country in 51 special excursions, in addition to the large number who travelled by ordinary trains.

In certain districts, such as North Wales, « Land Cruise » trains, on which refreshments are served, are regularly run during the summer on routes passing through particularly fine scenery, with stops at places of special interest.

The foregoing do not represent all the excursion facilities, however, as British Railways, in conjunction with a number of the principal Travel Agents, arrange a programme of special Theatre Excursions during the winter months. The very reasonable charges include meals on the trains, good seats at popular theatres with coaches to and from the theatre and, in some cases, a sightseeing tour.

During 1953, British Railways ran over 19 500 special excursion trains for nearly 7 000 000 passengers, figures

which give some indication of the demands for these popular facilities.

Amongst other excursion facilities organised by British Railways for the individual are combined tours round districts of particular beauty or to places famous in history, by rail and road, by rail and steamer and, in some cases, by all three means of transport.

In addition to all the various excursions, there are available, widely throughout the country, regular cheap day tickets (both first and third class) at very low fares. These offer an attractive medium for a day's outing, for shopping, pleasure or recreation.

For juveniles.

British Railways carry children of three years and under fourteen years of age at half the adult fares, whether ordinary or cheap (with the exception of Early Morning Returns) and in addition they extend other concessions to them.

Parties of eight or more juveniles under eighteen years of age can, by prior arrangement, obtain tickets (valid for the day of issue) at the ordinary third class single fare plus 50 % and those members of the parties who are under sixteen years pay at only half that rate.

Tickets, valid for one month, are issued by prior arrangement at the third class ordinary single fare and a half to juveniles of sixteen and under eighteen years of age and at half this rate to juveniles under sixteen years of age, who are travelling to camps and rallies or in certain other circumstances. Where the journey takes the form of a tour, single tickets are issued at three-quarters of the single fare from point to point and again, those under sixteen years pay only half fare. Officers or attendants (not exceeding one to every eight juveniles) who travel with them are also granted tickets at the third class single fare plus one half. Considerable use is made of this facility by Scouts, Cadet forces and other organisations.

Season Tickets are issued for residential purposes at half the ordinary season ticket rates to all juveniles under sixteen years of age and also to those of sixteen years and under eighteen years who are not in receipt of salary or other monetary allowance, exceeding 25s. 0d. per week. Juveniles of sixteen and under eighteen years who are in receipt of more than 25s. 0d. per week are charged two-thirds of the ordinary rates.

Other concessions.

The concessions mentioned so far do not, by any means, exhaust the list of cheap facilities afforded by British Railways. Others include those which are granted to relatives and friends visiting « long stay » patients in certain hospitals and institutions; to blind persons and their attendants travelling to and from their work; to members of the Mercantile Marine travelling home on leave from their ships and to their wives and children or to shipwrecked mariners.

There are reduced fares also for members of the Forces, and their wives and children under sixteen years, who travel on leave at their own expense; for relatives visiting members of the Forces in hospital and for boys of Military,

Naval and Air Force Schools travelling on leave.

Sports clubs can obtain day tickets at the ordinary single fare plus one half for their members travelling to and from the Clubs' grounds, subject to there being a minimum issue of 200 tickets per annum.

Finally, although no reductions in fares are granted to business firms, British Railways have introduced, for their benefit, an arrangement known as the Traders' Warrant Scheme. The numerous firms who participate in this scheme are provided with books of warrants which can be exchanged for tickets without any cash payment being necessary at the time of booking, accounts for the fares so incurred being rendered to them each month.

Refreshment and hotel facilities.

The ability to obtain a meal or refreshments in the course of a journey is one of the great attractions of rail travel and the Commission's Hotels and Catering Services (formerly the Hotels Executive), who are responsible for the catering arrangements on British Railways have raised the quality of their services to a high level. The refreshment and dining rooms — of which there are no less than 550 at over 330 stations — are being brought up to date with decorations, furnishings and equipment of the most modern designs and, at many places, the refreshment room and the waiting room are being combined into one. A feature of the modernisation of refreshment rooms has been the introduction, with excellent results, of the «self-help» or «cafeteria» service which attained such popularity during and in the years immediately following the war. The services of the refreshment rooms are supplemented at many stations by tea trolleys from which light refreshments can be supplied to passengers on the platforms or in trains and by automatic vending machines which afford a continuous service. Novel developments which are now being tried out are the mobile refreshment kiosk, a self-contained unit which can readily be towed by car to provide refreshment facilities at places where no other facilities are available; prefabricated kiosks, which can easily be transferred from place to place; and « motorised » or self-propelled kiosks which are used in connection with special events such as race meetings or football matches.

Attention has not been devoted solely to the amenities at stations. The Hotels and Catering Services and British Railways have collaborated in raising the standard of catering on trains to a high level. New designs have been prepared for restaurant and kitchen cars which embody the highest degree of comfort for the passenger and enable the staff to work with the maximum efficiency.

All the principal trains carry restaurant cars, both first and third class, which afford the highest standard of service whilst, for those trains which do not warrant the provision of restaurant cars, there are buffet cars on which either a meal or light refreshments can be obtained and Kitchen-buffets which, in addition to the normal facilities of a buffet car, enable full meals to be served in adjoining coaches. A recent and

popular innovation is the « cafeteria » car (illustrated below) and its modified version the « Party » car, in which passengers can obtain refreshments on the cars which will also provide a service of hot meals into adjoining coaches.

On those trains where the demand does not justify a separate car or

Fig. 5. — Cafeteria Car

« help yourself » principle. These have proved most popular on excursion and party trains and cafeteria cars are being tried out with encouraging results on certain regular train services. Improved designs have been prepared for cafeteria where the number of passenger-carrying coaches does not permit the addition of a separate refreshment vehicle, a novel unit has been devised by means of which a compartment can be converted in the space of a few minutes into a pantry

from which light refreshments can be served throughout the train.

The Hotels and Catering Services also provide snackboxes and packed meals for the individual passenger or for parties, with whom they are immensely popular.

Finally, there are 36 Hotels — 5 in London and 31 in other towns throughout the country — where the highest standard of comfort and service is provided for the traveller, the tourist or the holiday maker.

Fig. 6. — Seating accommodation in Cafeteria Car.

Luggage.

Unlike the road companies, the railways are under a statutory obligation to convey free of charge specified quantities of ordinary luggage belonging to the passengers they carry. At present the free allowance for passengers paying ordinary fares or holding season tickets — which, incidentally, is amongst the most generous in the world — is 150 lbs first class, 120 lbs second class and 100 lbs third class, half these quantities being allowed for children. Passengers holding early morning return tickets are allowed 60 lbs. Luggage in excess of these quantities is subject to reasonable charges in accordance with a statutory scale of Excess Luggage charges.

For the passenger who wishes to avoid the trouble of handling or looking after his luggage during his journey by rail, British Railways offer the « Passengers' Luggage in Advance » arrangement under which they will collect the luggage

and deliver it in advance at the passenger's destination practically anywhere in the country, at very reasonable charges. Alternatively, they will either collect the luggage and convey it to the destination station to be called for, or will accept it simply for conveyance and delivery.

The passenger who wishes to do so may leave his luggage in the care of British Railways at the Left Luggage Office at any passenger station for small charges, fixed according to the length of time the luggage is deposited, whilst « self-service » accommodation is being provided at many of the larger stations by means of batteries of lockers. The insertion of a coin in a slot enables the user to open the door of a locker, deposit his luggage and then, after locking the door, withdraw the key. When, later, the door is unlocked and the luggage taken away, the key is automatically secured in the lock to await the next depositor.

Modernisation of stations and offices.

First impressions are important and British Railways are, therefore, pushing on as quickly as circumstances will permit with schemes of improvement at their stations. Most of the passenger stations were built at a time when utility counted for more than a pleasing appearance and many are the worse for unavoidable lack of proper attention during the war and damage by bombing, whilst changes in population and the development of building or industrial estates have rendered some inadequate to cater efficiently for the present day volume of business.

In some cases, entirely new stations are being built whilst, in others, the existing buildings are being modernised. In all the schemes, however, special care is being devoted to the provision of a high and attractive standard of facilities and amenities for the travelling public. The lighting of stations and waiting rooms is being improved and the opportunity is being taken, at many places, to combine the general waiting room and the refreshment room into one.

Booking offices are being reorganised and equipped to well thought out plans, designed to enable the booking clerk to do his job with the utmost efficiency and, where the number of passengers booked justifies doing so, mechanical ticket issuing appliances are being introduced to speed up the rate of booking and avoid delay in serving passengers. In fact, the whole subject of mechanised issue of tickets is being closely studied at the present time with an eye to the possibility of adopting machines on an even wider scale.

Steamship services.

British Railways own one of the largest fleets of vessels in the country, many of which have been built since the war to the highest modern standards, and, in conjunction with the companies with whom they are associated on certain routes, maintain most of the sea communications for passengers to and from the Continent, the Channel Islands and Ireland as well as providing steamer services on inland and estuarial waters.

During 1953 nearly 17 000 000 passengers were carried on vessels plying on the various routes served by British Railways.

Continental Services.

Fast services are operated (in conjunction with vessels of the French National Railways on certain routes) to and from France daily on the popular routes via Dover and Calais, Folkestone and Calais, Dover and Dunkerque and Newhaven and Dieppe whilst there is a thrice-weekly service in each direction between Southampton and Le Havre. Sailings are also given regularly between Southampton and St. Malo in summer and between Jersey (Channel Islands) and St. Malo in the winter months. Boat trains from and to London connect with the services via Dover, Folkestone, Newhaven and Southampton whilst through services are also run between South Wales and Southampton. Through train services to Paris connect with the boats at the French ports, affording connections to all parts of the continent.

All the vessels have luxurious cabin, saloon and dining accommodation whilst, on the Dover and Dunkerque route, the modern ferry vessels carry sleeping cars which ply between London and Paris.

In addition, there are services from Dover to Ostend, operated by vessels of the Belgian Marine.

Other services with the Continent are operated daily in both directions between Harwich (Parkeston Quay) and Hook of Holland by new fast vessels, affording the highest standard of comfort to the passenger and connecting, on both sides, with through trains which link up with services to all parts of Britain and the Continent.

Through tickets can be booked to a large number of destinations on the Continent at British Railways' Continental Offices in London, at the Port Booking Offices or through the numerous Agencies. Passengers can register their baggage through to most of the destinations on the continent to which through bookings are available, at a number of the London termini and at the ports.

For individual parties of 15 and upwards, varying special terms are available, dependent on the route travelled. For instance, from London to Calais or Dieppe, the reduction in the ordinary fare is 20 %, while from London to the Hook the reduction is 30 % of the throughout fare.

Special terms are also granted to organisers of large parties of passengers, numbering at least 400 adults, or their equivalent, whilst, if the party is big enough, a special sailing will be arranged.

Channel Islands.

Regular daily sailings are made to the Channel Islands from Southampton and Weymouth, in connection with which there are boat train services from and to London (Waterloo or Paddington). The vessels with which these sailings are maintained afford a very high standard of comfort with cabin and saloon accommodation as well as commodious dining saloons. Accommodation on both boat trains and vessels can be reserved in advance.

Passengers to and from the Channel

Islands can have their luggage sent in advance under the Passengers'Luggage in Advance arrangements.

British Railways have introduced an attractive 15-day excursion fare on mid-week days, for the benefit of the many holiday makers who spend their vacations in the Channel Islands.

Ireland.

The British Railways' day and night services between Holyhead and Dun Laoghaire form the principal link with the northern parts of Eire. The vessels on this route do the crossing in 3 ¼ hours and offer to the passenger a very high standard of comfort. There is ample cabin and saloon accommodation, both first and third class, as well as excellent dining accommodation.

Southern parts of Eire are served by daily sailings on the Fishguard and Rosslare route and by sailings on alternate weekdays via Fishguard and Waterford. First and third class cabin and berth accommodation is available on these routes.

Day services are operated each day to and from Northern Ireland on the short sea route between Stranraer and Larne, a crossing of only 2 ¼ hours, by vessels on which are provided first and third class cabin and saloon accommodation as well as dining accommodation. Night services are available on weekdays, and on Sundays in summer, via Heysham and Belfast and on these vessels also there is first and third class accommodation.

Boat train services from and to London run in connection with sailings on all routes to Ireland with sleeping cars on the Stranraer and certain of the Holyhead services. Accommodation can be reserved on all these trains.

The numbers of passengers who use the Irish services are so large that on certain days during the summer months it is found necessary to regulate the traffic by means of steamer reservation tickets which are issued free of charge but the extent of this regulation is being reduced as rapidly as circumstances will permit.

Other Services.

Other vital services provided by British Railways are those on the Clyde estuary where their vessels maintain essential communication with the towns along the Clyde coast, and adjacent lochs as well as with the islands to the west. These services not only play an important part in the business and social life of the Clyde but they afford the means of enjoyment for thousands of tourists and holiday makers who take advantage of the excursions and tours arranged by British Railways.

British Railways also provide steamer services on a number of the Scottish Lochs and on Lake Windermere which play an important part in the tours and excursions arranged for holiday makers.

Less spectacular, but equally important in their own sphere, are the ferries which include such important services as those between the mainland and the Isle of Wight, the Humber Ferry between Hull and New Holland, the ferry across the Thames between Gravesend and Til-

bury (the two latter forming links in main road routes) and the ferry from Kyle of Lochalsh to the Isle of Skye.

Such then, is an outline of the story of British Railways and of some of their achievements in the service of the public but this brief account does not exhaust by any means the list of facilities they place at the disposal of their customers. The tradition of service is one of which they may well be proud but they are not content to rest on past achievements and as their resources increase it is their constant endeavour to improve on what has been done. Of necessity, much remains untold of the early history and of the immense task of welding four railways, each with a different system of operation and administration, into one efficient organisation.

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Coal class traffic on British Railways,

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Production and distribution of coal.

Prior to 1947, the mining of coal in England, Scotland and Wales was in the hands of colliery companies, but in 1946 Parliament passed the Coal Industry Nationalisation Act under which the industry was transferred to public ownership. A public corporation — the National Coal Board — was set up and on 1st January 1947, assumed control, taking over about 1 500 collieries and numerous ancillary undertakings previously operated by the colliery companies, such as coke ovens, by-product plants and brick works.

The results of the operations of the National Coal Board in terms of production, compared with the position in 1938 before the war-time conditions intervened, are shown below :—

Coal output (million tons saleable)

	1938	*1947*	*1948*	*1950*	*1952**	*1953**
Deepmined	227.0	187.2	197.6	204.1	212.7	211.8
Opencast	—	10.2	11.8	12.2	12.1	11.7
Total	227.0	197.4	209.4	216.3	224.8	223.5

* 52 weeks.

Note: In 1953, the miners had a second week's annual holiday and the tonnage lost attributable to recognised holidays was 5.3 million tons more than in 1952.

Production of opencast coal dates from the second half of 1942, when, in order to increase coal availability without extensive demand on labour, the British Government inaugurated operations to win coal from measures where they outcropped at or close to the surface.

The Headquarters of the National Coal Board located in London control production, manpower, scientific development, finance, marketing and other matters : contacts from the railway commercial standpoint are with the marketing department.

Below headquarters level, the work in the coalfields is the responsibility of nine Divisional Boards, the organisation of which stems from that at the higher level. Details of the Divisions showing their saleable deepmined output for 1953 and the areas of production for which they are responsible are :—

Saleable deepmined output

Division	1953 (52 weeks) (million tons)	Per cent of total
Scottish	22.8	10.8
Northern	13.4	6.3
Durham	25.9	12.2
North Eastern	44.9	21.2
North Western	15.6	7.4
East Midlands	44.4	21.0
West Midlands	18.1	8.5
South Western	25.0	11.8
South Eastern	1.7	0.8
Great Britain	211.8	100.0

The figures include output from small mines worked privately under licence from the National Coal Board.

Division	Coalfields covered
Scottish	Fife and Clackmannan, Lothians, Central, West and East Ayr and Dumfries.
Northern	Northumberland and Cumberland
Durham	East and West Durham
North Eastern	Yorkshire
North Western	Lancashire and North Wales
East Midlands	Nottinghamshire, Derbyshire and Leicestershire
West Midlands	North Staffordshire, Cannock Chase, South Staffordshire and Shropshire, Warwickshire
South Western	South Wales, Forest of Dean, Bristol and Somerset
South Eastern	Kent

Each Division (except the South Eastern) is split up into areas which each control a number of collieries in their particular locality.

In addition to coal, patent fuel is produced in the form of briquettes, ovoids, etc., and in 1952 over 1 700 000 tons were made available. Substantial tonnages of coke are produced at coke ovens operated by the Coal Board and the Iron and Steel industry and at Gas Board works for industrial, commercial and domestic purposes, the 1952 figure being nearly 30 million tons.

In October 1950, the National Coal Board produced proposals for reconstruction and investment in the coalfields. At that time, they assessed consumption in the years 1961/65 as likely to be between 230 and 250 millions.

The National Coal Board are continually, however, revising their plans in the light of forward estimates of their customers' requirements. The Ridley Committee, set up by the Government in July 1951, to study the further steps necessary to promote the best use of the country's fuel and power resources estimated annual coal requirements for the period 1959/63 as likely to be between 257-267 million tons.

Much of the coal needed for the upward revision to a total estimated requirement of about 260 million tons in the 1961-65 period will almost certainly have to come mainly from the highly productive and profitable East Midlands and North Eastern areas : output from the former may well reach 56 million tons in this period, or a percentage of 21.6 of the total required. Compared with 1938, when these two Divisions together only produced about 33 per cent. of total output, by 1961-65 the same two Divi-

sions are likely to produce about 40 per cent of coal output or, in terms of tonnage, over 30 million tons more, a position which will require careful study from a railway angle : increases in production in South Wales and Scotland are also planned with smaller variations elsewhere.

A major problem in coal distribution is the maintenance of supplies of coal from colliery areas to non-producing areas (such as London and the southern part of the country) or to producing areas with an output inadequate to meet local requirements (such as Lancashire).

Certain special purpose coals also require longer distance movement : hence, for example, the call for transport of gas coal from Durham and Yorkshire to the Gas undertakings in the south, for Durham coking coals to the coke ovens serving iron and steel works in the Midlands, for house coals of the East and West Midlands to London and the south and for anthracite and boiler fuels produced in South Wales over a wide area of the country.

Many coals produced in the various coalfields meet the requirements of consumers within the producing areas and such local distribution, together with the passage of coal from coalfields close to the sea-board to the ports for exports, coastwise movement and bunkers, represents the main field of short distance movement.

The following figures of inland consumption in 1938 and 1953 demonstrate the increased demand from the carbonising (gas works and coke ovens) and electricity industries and the effects of limiting the quantity of coal to the domestic market.

Inland Coal Consumption

	1938	1953
	(million tons)	
Gas	19.1	27.1
Electricity	14.9	36.7
Railways	13.2	13.8
Coke ovens	19.1	25.9
Iron and Steel, Engineering and other industry	42.0	43.7
Domestic	45.8	31.6
Miscellaneous	26.6	29.1
Total	180.7	207.9

Whilst in 1938 overseas shipments and bunkers amounted to 46.3 million tons, in 1953 only approximately 16.6 million tons were shipped.

Coal class traffic by British Railways — Tonnage and receipts.

About 77 per cent of all deepmined coal requiring transport involving payment of conveyance charges passes by rail. In addition, about 14 million tons a year of coal for the railways' own use are conveyed from the pits to motive power depots, power stations, etc.

Figures of originating tonnage of revenue earning traffic and receipts from coal class traffic conveyed by British Railways since nationalisation in 1948 are shown in the table which follows.

Besides reflecting the upward trend of tonnage, the increases in receipts also indicate the effect of the increases in conveyance rates over the period which amount to about 48 per cent in all.

	Originating tonnage		Gross takings	
	Tons (millions)	% of total freight traffic conveyed	£. (millions)	% of total freight train receipts
1948	161.1	58.4	66.3	36.7
1949	164.6	58.7	68.0	38.0
1950	167.1	59.4	77.8	39.1
1951	169.4	59.4	91.3	40.1
1952	170.8	60.0	101.7	40.6
1953 (52 weeks)	174.7	60.6	108.7	41.7

In terms of ton miles in 1953, coal traffic represented about 47 per cent of total ton miles worked on freight traffic. On a test made some years ago, it was found that nearly 60 per cent of the rail coal tonnage moved distances of up to 30 miles. Average length of haul over recent years has been :—

Miles

1951	*1952*	*1953*
58.32	56.32	56.94

Much of the above-average length of haul traffic originates on the London Midland and Eastern Regions linking the Midlands and Yorkshire coalfields with the south.

The average receipt per ton at the beginning of this year was about 12/6d.

The 1953 tonnage was divided between the six Regions of British Railways as opposite.

The London Midland Region serve the greater part of the North Western, East Midlands and West Midlands Divisions of the National Coal Board and the Cumberland section of the Northern Division. The Western Region cover the South Western Division and small sectors of the North Western and West Midlands Divisions. The Southern and Scottish Regions cater for the South Eastern and Scottish Divisions respectively. That section of the East Midlands Division not embraced by the London Midland Region comes within the province of the Eastern Region who also cover the southern part of the North Eastern Division. The rail service of the balance of collieries and opencast sites of the North Eastern Division is the responsibility of the North Eastern Region which also cover the Durham Division and the Northumberland section of the Northern Division.

Region	Originating tonnages (million tons) 52 weeks 1953
London Midland . .	48.4
Western	29.0
Southern	3.2
Eastern	28.6
North Eastern . . .	45.5
Scottish	20.0
Total (all regions) . .	174.7

Included in the coal class originating tonnages are traffics not emanating from collieries, washeries and opencast sites, such as coke from coke ovens and gas works, coal which has passed by coastwise vessels from ports serving the originating coalfield to ports in the area where the fuel is destined to be consumed and which has been loaded to rail for the final stage of the journey to consignees' premises and miscellaneous consignments of coal, patent fuel, etc., loaded at or reforwarded from British Railways stations or from private sidings.

Liaison between British Railways and coal producers and consumers.

Contacts between British Railways and the National Coal Board and other senders of coal class traffic exist at all levels. The local station master, yard master or goods agent and his staff are in constant touch with the collieries or works for whose traffic he is responsible in order to assess requirements and deal with any questions raised at that level : District Operating Superintendents are also in communication with collieries, etc., on wagon and operating matters. Under established liaison machinery, railway district officers are in touch with the area officers of the Coal Board and other organisations, such as Electricity and Gas undertakings, whilst the headquarters offices of the railway regions either directly or through divisional or district officers maintain contact with the divisional officials of the Coal Board or public utility undertakings.

A feature arising from the nationalisation of the coal, electricity and gas industries since the war has been the establishment in each case of headquarters in London for the purpose of formulation of national policy and overall control and/or guidance. Many other large industries such as the iron and steel industry, as well as the national organisations representing the coal traders and coal merchants similarly have central offices which deal mainly with matters of a national character where questions of policy or principle may be involved and negotiations on a national level are desirable. Such matters were previously dealt with from the railway side by the Railway Executive, which, in pursuance of the British Transport Commission (Executives) Order, 1953, was abolished immediately before 1st October, 1953, on and from which date the British Transport Commission themselves exercised the functions formerly exercised on behalf of the Commission by the Railway Executive.

The procedure to be followed in regard to these matters in the future will have to be consistent with the final form of the scheme of railway reorganisation which, under Section 16 of the Transport Act, 1953, has to be prepared and submitted by the British Transport Commission to the Minister of Transport. It is of interest over a still wider field to note that subsequently, under Section 17 of the same Act, the reorganisation scheme will be the subject of consultations between the Minister and (in the words of the Act) « such bodies representative of classes of persons likely to be specially affected by the scheme as he may think fit and with the National Coal Board ». The Minister « may then,

if he thinks fit, by order approve the scheme, either without modification or with such modifications as he may, after consultation with the Commission, think fit, and the scheme, as so approved, shall come into effect as from such date as may be specified therein ».

Provision of wagons for movement.

Prior to the last war, wagons for the movement of coal class traffic were mainly provided by the collieries, by wagon hiring concerns, or by merchants or consumers. Such wagons were ordered when empty to particular collieries or groups of collieries, involving a considerable amount of special working and shunting. Exceptions to this general practice were found in the north eastern area, in Scotland and in Kent, where the railway companies supplied railway wagons : taking the country as a whole, however, less than a fourth of the total wagons required for coal were provided by the railways.

At the outbreak of the last war, in order to obtain the maximum use of railway wagons and to restrict railway working to the minimum necessitated by overall traffic requirements, the private owners' wagons were requisitioned by the Government for use as required by the railways and the working of wagons in individual streams of traffic was abandoned, avoiding the necessity for sorting at marshalling yards and affording a substantial reduction in empty wagon mileage.

Under the Transport Act, 1947, the ownership of the previously privately owned wagons was vested in the British Transport Commission, compensation being paid to the former owners, and some 545 000 wagons were acquired in this way, thus perpetuating the operating economies which had been obtained during the war-time requisitioning period but also transferring the responsibility for keeping the pits supplied with empty wagons to the railways. The mineral wagons included in this total ranged from a tonnage capacity of about 8 tons upwards to about 25 tons, the smaller wagons having been built to meet the requirements of small traders requiring only limited quantities of coal at a time. About 70 per cent. of the wagons had grease-lubricated axle boxes, but the process of switching to oil axle boxes has since progressed steadily as new railway mineral wagons have been introduced : over half the grease box vehicles have now been eliminated.

Since the beginning of the century, steps had been taken in various directions to achieve economies by increasing the size of the load which could be conveyed in a single wagon. In 1904, the North Eastern Railway adopted the policy of building hopper wagons of 20/23 tons capacity by introducing them for the movement of coal from local collieries to the shipment staithes of the nearby port systems. In 1923, the Great Western Railway initiated a campaign to increase the size of mineral wagons for the conveyance of coal to the South Wales ports and works. The Standing Committee on Mineral Transport reported in 1929 that there were at that time under 26 000 20-ton wagons in use for mineral traffic, or about 3 per cent. of the total number of mineral wagons. Whilst the Com-

mittee recommended the adoption of the 20-ton wagon as a standard, their investigations revealed that owing to physical limitations a large proportion of the collieries and of private sidings serving destination works could not deal with wagons of this capacity and but little progress was subsequently made.

During the war years, the 12-ton wagons were authorised to carry 13 tons and 16-ton wagons were built, later being regarded as the standard mineral wagon.

One of the earliest actions taken by the former Railway Executive was the setting up of a committee to study the question of the patterns to which wagons (and locomotives and carriages) should be built in the future and, after due consideration, it was decided that from the angle of economical railway operation the ideal mineral wagon which should be adopted for the future was one of 24.5 tons capacity. Such a wagon would offer the following advantages :

1) increased ratio of pay load to tare resulting in less gross weight to be hauled to convey a given quantity of coal;
2) reduced tare weight for empty haulage;
3) reduced overall length of wagon (and train load), giving saving in lengths of sidings required to accommodate trains;
4) reduced tractive effort to haul a given load;
5) reduced shunting at marshalling yards and terminals;
6) reduced surplus stock when production below normal during holiday periods, etc.;
7) reduced time in transit wagon examination for a train load.

The 24.5-ton wagon is the vehicle affording the greatest cubic capacity of coal which can be carried on two axles. Examination of wagons of up to 50-ton capacity indicated that with the introduction of bogies, the increased annual charges outweighed any operating advantages and economies which could be gained and physical limitations, particularly at terminals, precluded the adoption of such a wagon as a standard.

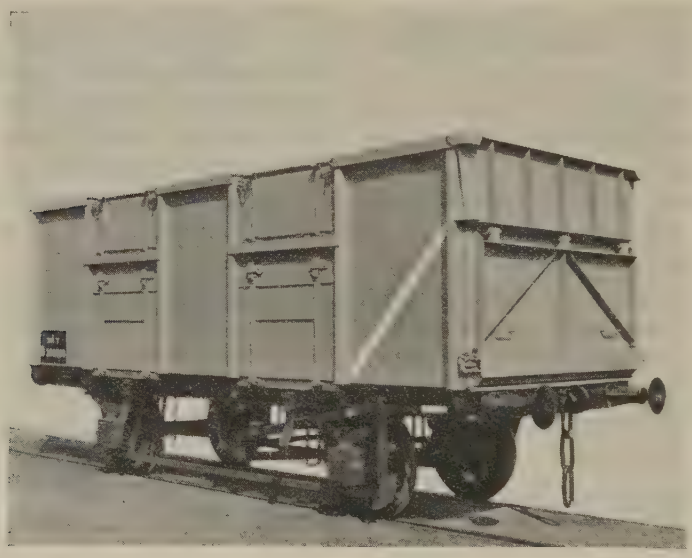
The new standard will be built in two types : the dimensions will be as follows :—

	Non-hoppered	Hoppered
Length over headstock .	21′ 6″	21′ 6″
Wheel base . .	12′ 0″	12′ 0″
Extreme height from rail . .	9′ 10 15/16″	10′ 6″
Tare weight. .	10 tons	9.8 tons

The non-hoppered wagon (illustrated) will have four side and one end doors. The hoppered type will provide for discharge through doors at the base of the hoppers.

A recent survey suggests that owing to height of colliery screens, siding layout, etc., only a relatively small proportion of the annual output of coal is produced at collieries which can at present handle the 24.5-ton wagons without restriction : because of wagon tippler limitations and other physical reasons, the major

proportion of large consumers' works are similarly placed. New and reconstructed collieries, works, shipping appliances and stations will be equipped to deal with the high capacity wagons. The National Coal Board and the nationalised public utilities and traders organisations are co-operating to make the most effective use of the wagons, the first batch of which has been produced. Some adaptation of existing facilities and re-allocation of coal supplies may probably be necessitated and, for the reasons mentioned, the new type wagons will, at the outset, have to be maintained in circuit working between those collieries and consumers who can handle them.



Non-hopper wagon.

About 63 per cent of present mineral wagon fleet is composed of wagons of 13 tons capacity or under, about 26 per cent of wagons of 14 to 18 tons capacity and the balance of wagons of 20 tons capacity or over. Average tonnage capacity (based on coals loading 42 cubic feet to the ton) is approximately 14 tons per wagon, but many coals (and coke) load less well and the average load per wagon at starting point for all coal and coke traffic was 11.72 tons at the end of last year, compared with 10.92 tons in 1948 and 10.37 tons in 1938.

At the end of 1953, the total number of mineral wagons in use was about 590 000. This figure is about 100 000 wagons fewer than in 1947 : because of the increase in average capacity of mineral wagons, the tonnage capacity of the fleet is some 300 000 tons less. When regard is paid to the fact that well over 25 million more tons of coal were

carried by rail in 1953 than in 1947, it will be seen that there has been a striking improvement in efficiency since 1947 to which improved round trip time (covering loading at colliery, loaded transit, time at destination and return empty transit) has also made a substantial contribution. It was calculated that in 1929, on average only two loaded journeys a month were obtained from coal wagons; now with common ownership and the whole wagon fleet under effective central control, on average about three loaded journeys are obtained. The number of wagons under or awaiting repair has also been materially reduced.

It has not been the practice to fit mineral wagons with vacuum or air brakes but experiments are being made with train load working of fitted wagons to gain further experience under practical conditions.

The day to day distribution of mineral wagons for coal class traffic is arranged by the Freight Rolling Stock organisation of the Operating Department of the railways and is mainly based on daily information furnished by telephone by the collieries (later confirmed) as to the number of wagons weighed and labelled for despatch during the previous 24 hours, the number of wagons on hand (loaded and empty) at noon and the number of additional wagons required for loading during the ensuing 24 hours, regard being paid to any wagons in use internally at the pits, wagons on hand under or awaiting repair, wagons on hand with inwards loads or outwards loaded waiting orders for despatch. The requirements formulated from these figures are considered in the light of the empty wagons available or likely to be available as daily reported by marshalling yards, ports and stations and, subject to any special considerations, distribution is arranged in accordance with an agreed formula, which broadly affords the collieries a wagon standage (loaded and empty) equal to 1 1/3 to 1 1/2 of the daily average number of wagons forwarded loaded the previous week, with additional allowance to cover standage at pits of inwards loaded, internal user and crippled wagons. District Offices arrange local distribution within their districts, advising details of wagons surplus to requirements or number of additional wagons required to their Divisional or Regional Offices, where further adjustments in the distribution are made. The Freight Rolling Stock section at British Transport Commission Headquarters are advised during the same afternoon and adjust surpluses or deficiencies inter-regionally via pre-determined or specially determined routes, bearing in mind any special representations which may be made from National Coal Board Headquarters through the liaison machinery.

This central control has been found to be of great assistance in adjusting the wagon stock position to meet the varying requirements in the various coalfields, and ensuring an equitable distribution having regard to all known factors and without any bias towards particular coalfields or regions.

The broad situation is that at the present time 330 000 wagons are required to load weekly to maintain the supply at collieries and to ensure that coal produced is loaded currently to

wagon. Any failure to sustain the wagon supply at any colliery or opencast site has immediate repercussions and if production is to be maintained necessitates the coal being put to ground at the colliery stocking sites where available or being disposed of by road transport.

Use of the wagons at the collieries, coke works, etc., is kept under notice by means of the statistical information available and by periodical physical spot checks at the pits themselves. Where wagons are retained for purposes of internal user for movement of coal within the colliery precincts, charges are levied. Wagon user charges are also raised where coal is loaded in wagons at the colliery screens for movement to a washing or cleaning plant and are increased if wagons are detained more than one day.

Before the war, when periods of slack demand from customers were experienced during the summer months, there was a tendency to ease on coal production and coal mined surplus to current orders was held in the then privately-owned wagons until a market was found, often at a price more favourable to the consumer than later in the year. Since the war, it has been normally possible for the Coal Board to sell currently all the coal produced throughout the year. This has meant that the annual productive curve, apart from holiday periods, has tended to be much flatter than previously and that coal when loaded in wagons has had an immediate market outlet, thus minimising wagon detention at pits waiting orders. Output during the week also now tends to be flatter, spreading the tonnage offering for transport fairly evenly over the week. About 60 000 wagons are lifted from collieries, opencast sites, etc., on a normal full working day.

Movement.

Consumers have found it desirable to stock coal received surplus to immediate requirements during the summer in order to build up reserves for the winter period, when consumption exceeds production, and thus ensure maintenance of full industrial production. Whilst in April 1953 distributed stocks in consumers hands only amounted to 12.3 million tons, last December they reached a level of some 19 million tons, divided as shown in the table hereunder.

	Million tons	Number of weeks supply
Electricity undertakings	6.3	7.8
Gas undertakings	3.2	5.1
Miscellaneous industries	3.5	5.2
Merchants' stocks of house coal, anthracite, boiler fuel, etc.	2.2	3.0
Coke ovens	1.1	2.3
Other consumers	2.8	—
Total	19.1	—

Arising from this seasonal stock piling, there is a tendency for the Coal Board to despatch coal to the areas most remote from the coalfields during the summer when the weather conditions are favourable in order to build up customers' stocks to a safe level, thus ensuring the position should unfavourable weather during the winter temporarily impede transport movement.

The relatively steady level of production throughout the year and the avoidance of peak movements during the period of maximum consumption in the winter are generally favourable to rail operations, although some of the major coal movements now tend to coincide with the later period of heavy summer passenger traffic and railway staffs' holidays.

Wagons are normally cleared from the collieries by local train services to nearby marshalling yards where they are shunted for forward working either direct to destination or made up into train loads for transport to another yard in the direction of the destination of the wagons. The fact that production of coal is in the hands of a national undertaking and that many of the consuming works are now concentrated under the control of large scale national organisations, such as the British Electricity Authority and the Gas Council, has led to a high degree of rationalisation and stabilisation of movement of coal between forwarding Coal Board Divisions, Areas or even individual collieries and receiving districts. This development has facilitated economical movement : besides the booked and special services for movement of truck load consignments, a large number of block trainloads is scheduled to work regularly from collieries or nearby yards either through to destination works or to distant marshalling yards serving groups of works or stations. The working of traffic between forwarding and receiving areas has been examined with the view of avoiding congested sections of lines and heavily loaded junctions and marshalling yards, thus again offering prospects of quicker transits. In order to afford economic production, the National Coal Board plan to work more pits with a daily output in the 4 000 to 6 000 tons range and this development will also afford prospects of greater efficiency in railway operation as compared with the past when the average output per colliery (excluding the small workings) has only been about 1 000 tons per day.

The overall position in regard to current movement is reviewed at the inter-regional operating conferences each morning and traffic switched, if necessary, to ease overloaded routes and junctions and utilise as an alternative other sections and junctions which may have spare capacity. The aim is to maintain full production at the pits and, where necessary, contacts are made with the N.C.B. Divisional or Headquarters offices with requests for assistance by restrictions on loading via overloaded routes and temporary diversions to other areas not similarly affected. In the case of an incident which blocked a main trunk route, this machinery enabled instructions to be in the hands of collieries within a few hours of the derailment.

In the case of intensive traffic working, such as the movement of shipment traffic from collieries to docks and coal to large works, in some areas regulation systems are in operation under which lifting of wagons from the pits is governed by the news of the movement of ships and the available head of traffic at the ports in the one case, or the number of wagons standing under load at the works and estimated requirements on the other, thus mini-

mising undue detention of wagons at the terminals.

One striking feature to which special attention should be drawn is the profound change in the direction of the flows of traffic from the coalfields which has been occasioned by the increased proportion of coal moving for inland consumption. In 1937, inland consumption of coal totalled about 187 million tons and foreign exports and bunkers some 52 million tons. Last year, inland consumption had risen to just under 208 million tons and exports and overseas bunkers had fallen to below 17 million tons. Much of the export traffic emanates from the north east coast and South Wales with relatively short hauls to the ports, whilst inland traffic tends to move much greater distances especially from the North Eastern and East Midlands coalfields. The effect on the amount of work performed by the railways is perhaps best expressed in terms of net ton miles which for coal class traffic in 1937, were 8 910 million and in the 52 weeks of 1953 were 10 675 million.

Terminals.

The transference of the ownership of mineral wagons to the railways has intensified the latter's interest in the speedy turnround of wagons of coal at terminals. A charge for rent for use of siding only is raised if a private owner wagon is detained at a railway depot. The railway owned wagon, however, is within the provisions of the Demurrage Regulations and a charge per wagon day is levied if the wagon is detained beyond the free period. The latter at stations and depots after conveyance of the wagon comprises one free day excluding the date of receipt by the trader of advice of arrival. At private sidings, one free day is given after the day on which the wagon is placed at trader's disposal if the wagon is returned empty, with an additional day if returned to the railway loaded for despatch.

At many industrial private sidings, wagon standage schemes are in operation under which a debit representing the weekly total of wagons standing under inwards load daily and any wagons supplied for outwards loading daily is set off against the weekly total of credit represented by wagons discharged and/or loaded for outwards despatch daily, the credit figure being multiplied by one and one-third. Any balance on the debit side is charged against the trader in accordance with an agreed formula. Special arrangements apply at ports.

Responsibility for minimising detention of wagons at terminals is in the first place in the hands of the local goods agent or station master, who follows up cases of undue detention with individual consignees, in the case of domestic coal enlisting the aid of the depot manager appointed under the national House Coal Distribution (Emergency) Scheme where necessary. Subsequent action is taken by the district or regional headquarters where local efforts prove unavailing. In the exceptional cases where all other efforts to remedy the situation have failed, a railway embargo is placed on the acceptance of traffic for the particular consignee through the divisional transport office of the National Coal

Board and is maintained until the position has been restored to normal.

The re-equipping of existing works and erection of new large scale power stations, gas works and industrial plants with modern facilities for handling and discharging wagons have tended to improve the turn-round of wagons.

By the measures taken to cover the position at forwarding point, intermediately and at destinations, continuous efforts are made to ensure the maximum use of the railway mineral wagon fleet by minimising detention at either end and by facilitating intermediate movement. Delays of any serious dimensions at either collieries or terminals or in forwarded loaded or return empty movement can quickly react adversely on wagon supplies to the pits and efficient working in this respect makes a vital contribution to improved round trip time reducing the number of wagons required to cover day to day operations and thus saving capital expenditure.

During the period of intense inter-railway competition last century, it was frequently the case in any large city or town that a number of railway companies each established their own terminal for the handling of merchandise and mineral traffic. The development of road transport based on the internal combustion engine has very substantially widened the area which can now be conveniently and economically served from one depot and from time to time examinations have been made of the possibility of centralised coal railway depots to obviate the necessity of maintaining and servicing a multiplicity of relatively small terminals.

Proposals of this character frequently lead to the consideration of mechanised facilities at coal depots. At some depots, notably in the north east of the country and in London, where circumstances were favourable to such treatment, facilities were provided from the earliest days in the form of coal « drops » so called because wagons are discharged from a high level siding through their bottom doors into cells at a lower level from whence deliveries are made by road vehicle. Present day capital costs of mechanisation schemes on the scale required are, however, very considerable.

The development of so called satellite towns to accommodate the over-spill of population from London has given an opportunity for fresh consideration to be given to the problem as in some cases it will be necessary to develop an entirely new railway coal depot at such points. Discharge of coal in bulk from railway wagons by a mobile crane fitted with a grab attachment is already in use at some existing terminals. Such an appliance working on suitable road surfaces of adequate width, flanked by rail sidings on which the incoming wagons of coal can be berthed and transferring the coal either direct to road vehicles where available or for subsequent delivery to movable steel hoppers capable of taking a large truck load and normally located at convenient intervals along the length of the coal yard, may prove to be both effective and economic. The outlets of the hoppers can be fitted where required with a device to enable house coal to be bagged and weighed. Suitable wharfage accommodation would be re-

quired on which to build up stocks of coal for which current orders were not held and from which coal could subsequently be loaded to vehicle or hopper by the crane when delivery was necessary. A solution of the problem is likely to come by a process of evolution through practical experiment by the larger concerns in the coal trade. It may be found that by reason of the circumstances of the site and the type of trade involved, no common solution will be possible.

Acceptance of traffic : standard terms and conditions — Claims aspects.

Coal class traffic on British Railways is accepted and conveyed subject to standard terms and conditions of carriage.

Under the conditions, the railways are not liable for loss, damage, deviation, mis-delivery, delay or detention to a consignment or any part thereof unless occasioned by the neglect or default of the railway or its servants.

Some of the wagons in use for coal traffic, many of which have wooden bodies, have been in service for many years and, by reason of the nature of the traffic and the methods employed in loading and discharge, sustain fairly heavy wear, resulting in defects to side, end or bottom doors, holes in floors, etc. By arrangement with the railways, the National Coal Board undertook to inspect wagon bodies and body fitments before loading at most of the collieries and to patch or plug obvious defects of this character to avoid loss in transit, rejecting any wagons which are not capable of « first aid » treatment in this way for more thoroughgoing repairs by the railway or their wagon repairers. Nevertheless, claims for alleged loss by reason of such defects were received by the railways and if inspection of the wagon suggested that the defect had existed prior to loading, the party making the claim was frequently referred to the National Coal Board for satisfaction. In many such cases, the Coal Board maintained that the wagon was in a safe condition to carry its contents when it was loaded, the inference being that the defects had developed during transit, and also rejected the claim. As a result, the coal traders complained strongly that they were being referred from one party to another in such instances without being able to obtain settlement of their claims. Following negotiations between the Railway Executive and the National Coal Board terminating in 1950, it was agreed that complaints of short weights attributable to defective railway wagons should be made by traders to the railways if the trader paid his own carriage charges or otherwise to the Board and that the party approached should, subject to verification of the facts, meet the claim, leaving details as to the manner in which the outpayment should be shared between the N.C.B. and the railway to be settled afterwards. This arrangement has proved satisfactory and is an interesting example of co-operation between the two nationalised industries.

As the result of post-war legislation, the terms and conditions are due for revision in the light of present-day circumstances.

Conveyance rates and charges.

The present conveyance rate structure for coal class traffic over British Railways has an historical basis dating from the Rates and Charges Order Confirmation Acts, 1891 and 1892, under which maxima were scheduled for the separate railway companies in existence at that time on a per ton per mile basis usually with a « taper » element (lower charge per mile) as the distance hauled progressed. The quantum of these rates and charges not only varied according to its circumstances from railway to railway but also between different sections of the same railway. Where more than one railway served a particular coalfield or consuming centre, inter-railway competition had frequently involved the maintenance of rates below the legal maxima. Among other factors which bore on the fixation of rates by the railways were (*a*) the fostering of inter-coalfield competition in a particular market; (*b*) competition with alternative methods of transport; (*c*) the desirability for stimulating exports, and competition between railways and ports for the shipment traffics; (*d*) commercial circumstances such as the desirability of keeping down the price of coal to long distance consumers; (*e*) appeals from large industrial users to minimise their transport costs on raw materials; and (*f*) the necessity for keeping charges at a low level on coal from collieries not equipped with coal preparation plants to other pits so provided, coal for colliery boilers, etc. Once the general pattern was established, the tendency was for any further rates required to be made by a process of analogy with the figures already on the books between similar pairs of points.

After the first world war, an effort was made to eliminate the very numerous exceptional rates by codifying them on a broad purpose basis such as for shipment, for blast furnaces and ironstone mines, and for all other purposes, introducing appropriate scales on a continuous mileage basis, again on a tapering basis as the distance progressed. These proposals to regularise the coal class rates structure met strenuous opposition from the Mining Association and other bodies engaged in the coal trade who maintained that any steps to introduce rates on a uniform basis would deprive firms, who had previously enjoyed advantageous rates because of their geographical location, of their favourable terms and would disturb trade connections built up over a long period of years. After long negotiations, the railways agreed to abandon their proposals for introducing uniform scales and (with certain exceptions) to bring forward the rates previously charged on to their new rate books prepared to operate from 1st January, 1928, the « appointed day » under Section III of the Railways Act, 1921. At the same time, however, a standard scale of rates per ton per mile on a taper basis was introduced becoming, in effect, the new maxima as any rates in force previously at a higher level than the appropriate charge on the standard scale were reduced to its level. The rates were noted for consignments of a minimum weight of 7 tons coal and 4 tons coke and were, generally speaking, for conveyance in private owners' wagons (except in those parts of the country

where it was the practice for the railway to supply wagons for coal class traffic) but a scale of wagon hire on a mileage basis was also provided for charging where railway wagons were used. This pattern of coal class rates with all its anomalies has been subjected to percentage increases from time to time in line with rising railway costs of operation : the last increase was one of 10 per cent operating from 1st March, 1954, bringing the aggregate increase to approximately 143 per cent above the 1938 level.

There have been many developments in the transport field, in the structure of industry and in the use of alternatives to solid fuel since the coal rates structure was last revised during the third decade of this century. A fresh study of the situation had been undertaken under the Railways Act, 1947, which laid the duty on the British Transport Commission of preparing and submitting to the Transport Tribunal draft charges schemes for confirmation and the position is now again being reviewed in the light of the provisions of the Transport Act, 1953. This measure amends the 1947 Act in regard to charges schemes which will now provide, inter alia, for :—

(*a*) charges for the carriage of merchandise by railways;

(*b*) railway tolls for use of the railways of the Commission by traffic drawn by engines not belonging to the Commission (a provision which will cover the use by the National Coal Board of short sections of the railways in accordance with past practice for intermediate passage from colliery to washery, etc.).

Such schemes will, generally speaking, fix maximum charges but will not provide for fixed or standard charges and will, subject to the provisions of the Act, secure that the charges to be made will be left to the Commission's discretion and that no conditions or limitations are imposed on that discretion. Under the charges schemes, whilst the Commission will have to publish the maximum charges, they will not have to publish any other charges (hitherto railway rate books have been open to inspection on demand). Under this legislation, the railways are also relieved of certain legal obligations which date from the earliest days, of affording equality of treatment under like conditions and of the prohibition which has hitherto obtained against according undue preference to any particular trader or traffic, but traders are accorded a protective clause in those cases where railway transport has a monopoly. Until charges schemes are introduced, however, exceptional railway rates will still be subject to Section III of the Railways Act, 1921, under which rates have to be published and the consent of the Tribunal obtained if more than 40 per cent below standard. A further section of the 1953 Act enables the railways to agree with a trader a charge or charges for the carriage of all or any part of his merchandise.

Accounts and documentation.

Carriage charges on coal class traffic originating on the main coal carrying regions are, with minor exceptions, collected through the agency of regional central charging offices. Consignment notes are passed by the authorities at col-

lieries, opencast sites and other sending points to the invoicing railway station at the forwarding end. Invoices showing the essential details (destination station or siding, truck numbers, weight, etc.) are prepared at these stations and a copy of the invoice is despatched to destination end as a check on the receipt (or non-receipt) of the consignment. The forwarding station also prepares a daily summary of the consignment notes from each colliery or other forwarding point for which it is responsible and sends a copy of this summary, together with the consignment notes, to the appropriate central charging office to enable the latter to check that the whole of the notes have been received. At these points, the essential details are punched on to cards, which are subsequently passed through a mechanised accounting machine process by means of which accounts, summaries and statistical data are produced in accordance with requirements. As a check on correct and complete charging, information is supplied by destination stations of trucks received for which no invoice is held and by this and other methods discrepancies are disclosed and necessary adjustments made in the accounts.

Credit facilities are available to the National Coal Board, other large senders, factors and merchants, and accounts are normally rendered in the second week of each month for the previous month's traffic, payment being required by the 25th day of the month in which rendered. Carriage accounts against the National Coal Board are transferred by the Regions in which they are incurred to a central office for settlement with the Board in conjunction with the latter's bill to the railways for coal for locomotive and other purposes.

In South Wales, the National Coal Board have co-operated with the railway in the introduction of a system of joint N.C.B./rail documentation under which a multiple set of documents is prepared at the collieries : three documents in each set are for N.C.B. purposes and the remaining three documents in each set (suitably printed) are handed to the railway for consignment note and invoice purposes. A study is being made of this experiment with the view to its possible extension and at the same time the whole subject of coal class transit and accountancy documentation has been brought under review for the purposes of achieving maximum economy consistent with efficient and adequate safeguards.

Competition for coal class traffic.

As the following National Coal Board figures indicate, coal class traffic is by no means a monopoly of railway transport in Great Britain :—

Transport of deepmined and opencast coal (million tons).

By	*1949*	*1953*
British Railways	157.1	163.5
N.C.B. private railways	10.2	11.1
Road transport	20.8	26.2
Canal	3.8	4.2
Other methods	6.7	5.7
	198.6	210.7

Included in the 1953 totals were 30.4

million tons of coal conveyed to the ports for subsequent coastwise shipment.

The tonnage moved over National Coal Board private lines emanates from collieries in the Durham and Northern Divisions and passes mainly to privately-owned shipment facilities in the same localities : smaller quantities pass in the same way between Scottish pits and ports. The remainder of the tonnage is for inland consumption at wharves and works connected by the private lines with collieries in the North Eastern, West Midlands, Scottish and other coalfields.

Restrictions on capital expenditure and shortage of steel in post-war years limited the building of mineral wagons and additionally in 1951 serious staff shortages on British Railways created temporary difficulties in the effective movement of traffic : to afford a measure of traffic relief the Board took the step of diverting from rail to road (and to coastwise vessels) considerable quantities of coal. In the result, the tonnage passing by road transport in 1951 increased appreciably and whilst the improved railway position since has enabled increased tonnages to be conveyed by rail, the road movement in 1953 was still very much higher than in earlier years. The continued improvement in the availability of rail facilities should lead to the restoration to rail of a greater proportion of the tonnage available for revenue transport from deep mines and opencast sites but competition for coal, particularly to consumers without private rail siding facilities, is hardening. Road competition is also experienced in the transport of coastwise coal from ports to nearby works and other consumers, regular transport arrangements having been made on these lines by some Area Gas Boards.

Movement of coal in bulk by coastal vessel in certain circumstances has considerable advantages and the public utility undertakings (Electricity and Gas Boards) are increasingly locating their works where possible at waterside premises on the coast or adjoining rivers in order to take advantage of these factors. The British Electricity Authority are having boats built for this purpose as well as chartering private vessels and the Gas Boards are also extending the facilities available for coastwise movement. Where works or power stations are situated up the River Thames, the boats are specially constructed to enable them to negotiate the river bridges and thus avoid transhipment. Where conveniently situated in relation to collieries and consumers' premises, barge movement on canals or rivers is also favoured but this form of competition is relatively restricted and consequently stable.

In other cases, collieries are located relatively close to works consuming their coals and intermediate conveyance is arranged by linking private rail sidings or is performed by conveyor belts or aerial ropeways.

Over recent years reference has been made to the possibility of moving coal by hydraulic transport through pipe lines. The Coal Board have erected a pilot scheme at a colliery in the Midlands for the conveyance of coal from the pit shaft to a washery 300 yards away. The scheme may be of particular benefit to the movement of coal below ground and has also possibilities in the raising of the coal to the surface in place of the normal

methods. Further thought, however, is being given to the practicability of using pipe lines for conveying coal from pit to the consuming area over fair distances using booster pumps. Many problems would have to be solved, notably questions of degradation and the disposal of the coal (and the water) at destination end. As many grades of coal are normally produced at any one colliery and are also required in any area of distribution, many commercial considerations come into play and the whole subject is still in the early technical and experimental stage.

There are also forms of indirect competition for coal class traffic. The British Electricity Authority plan to build a number of new large power stations in the Midlands close to the pits. The resultant power produced will be transferred by high voltage lines to distant parts of the country in lieu of transporting coal from the coalfields to distant power stations for the production of electric current for relatively local distribution in the area where generated. The linking up of the various parts of the country to the national grid enables a saving in capital expenditure to be effected in the provision and maintenance of spare generating plant in each locality to meet peak loads : it has also been claimed that savings in inland transport costs of coal make a substantial contribution to the heavy capital costs necessitated by the construction and maintenance of the grid.

The future will doubtless see generation of electricity from nuclear fuel but, for many years, this will supplement rather than replace coal as a source of power.

The possibilities of resources of natural gas being available are being explored, notably by the Gas Council.

Experiments in the use of methane or waste colliery gas are being conducted at the Point of Ayr Colliery in North Wales and elsewhere and, if successful, it is understood that arrangements will be made to distribute the gas by pipe line to neighbouring towns which, in turn, would either wholly or in part obviate local production of gas from coal. Trials are also in progress of methods of underground gasification of coal from seams of poor quality or narrow dimensions which would not justify operations by normal mining methods, it being the intention to pipe the resultant gases to the surface for subsequent distribution. The Gas Boards are also in many cases laying pipe mains to link production from gas works which have been enlarged and modernised with areas of consumption previously served by old and redundant plant, to which coal has previously moved by rail transport. In parts of the country where there are coke ovens serving blast furnaces at steel works, etc., the Gas Boards are taking increased supplies of oven gas, thus minimising capital expenditure on their own productive capacity.

Oil and other liquid fuels are being increasingly used in industry generally and as alternate means of gas making.

In all these respects, the task of British Railways is to keep abreast of developments, accept the challenge of competition and initiate action which will conserve and improve rail revenue.

[385. (06. 111]

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

Final summaries adopted at the sixteenth Session (London, 1954).

SECTION I. — Way and Works.

QUESTION 1.

What are the present tendencies relating to the organisation of the maintenance of the permanent way : methods of determination of the works to be done and in particular, possibilities of the use of detecting-recording coaches; planning of the works, effects of mechanisation; importance of the side-tracks for the movement of the gangs and the mechanical devices.

Economic and financial aspect.

SUMMARIES.

« 1. The maintenance work of the « length gangs varies in different Railway « systems according to circumstances « such as climate, density of population, « wages, social and economic conditions, « cost of materials, living standards, etc.

« 2. Up to the last year or two, length « gangs were generally organised in small « gangs (at least six men) responsible for « all maintenance work on the length in « question (inspections, maintenance work « proper, as for instance levelling, lining, « gauging, weedkilling, etc.) and various « other work of local character, such as « relief of permanent level crossing keep- « ers.

« The burden arising from these tasks, « as well as lodging difficulties and trans- « port of personnel, make it difficult for « the Administrations to realise a reduc- « tion in the manpower employed in day- « to-day track maintenance.

« 3. Railway Administrations endea- « vour to reduce to a minimum track « maintenance costs with due consider- « ation to the necessity of carrying a « constantly increasing weight and speed « of traffic in comfort and security.

« 4. Especially in countries where in- « creasing wages have made it necessary « to get the very most out of the man- « power, trials have successfully been « undertaken in which the following two « fundamental tendencies appear :

« *a)* the search for an improvement in « overall productivity by the concentra- « tion of personnel in longer gang lengths « with a strength of at least 8 men, or « by the use of mobile gangs in con- « junction with reduced local gangs.

« *(b)* the search for an improvement « in individual productivity by the use of « motorised tools which allow of the « same individual carrying out more « easily some more important works.

« 5. The solutions agreed should allow « of :

« *(a)* the reduction in the overall num- « ber of gangers and a better organisation « of the work;

« *(b)* a greater continuity and more « clearly defined tasks allotted to each « ganger;

« *(c)* the production of more uniform « and probably more durable work;

« *(d)* the carrying out of relatively « important track work may fall within « the scope of private enterprise.

« 6. The economic and density of po- « pulation factors have an important « influence on the predominance accorded « to one or the other of the tendencies in « the solutions applied : each of them « having, moreover, its limits of applic- « ation. The same factors can tend to « increase or reduce that part of the work « let to contract.

« 7. Concentration allows the manage- « ment to follow more closely the work « carried out by the gang. On the other « hand, the social advantages of personnel « returning each evening to their homes « should not be overlooked. This is a « question to which the men, in general, « attach great importance.

« Mechanisation is already largely « applied to major renewals in connection « with which the question no longer arises. « For the smaller works of day to day « maintenance its application should be « more carefully considered. It necessit- « ates a very precise appreciation of the « works to be done in order to avoid « unnecessary operations.

« To get the best result from the use « of mechanical tools supervisors and « operators must be well trained in their « use and daily maintenance.

« 8. The determination of the mainten- « ance works to be done has for many « years generally been based on :

« *(a)* the experience of the durability « of the work under the local conditions « involved (predetermined cycles). This « depends partially on an estimate and « can vary much from place to place;

« *(b)* the very careful examination in « the field of the track (systematic sur- « veys). These surveys are complicated « and take much time;

« *(c)* the appearance of trouble in the « track.

« 9. *(a)* After recognising the insuffi- « ciency of the «stitch in time » method « for assuring the proper condition of « permanent way because when work is « put in hand the faults may well have « reached a stage where they are irrepar- « able, some systems have adopted a « general method of overhaul applicable « to the whole of the system which is too « onerous.

« *(b)* The introduction of methodical « maintenance covering a periodic general « overhaul and a limited overhaul to deal « with level, especially at the joints, and « tightening up the fastenings, has resulted « in savings, especially from the labour « point of view.

« *(c)* The necessity for maintenance « operations is no longer based on a « simple estimate of the actual condition « of the track, but chiefly on an estimate « of the probable rate at which it will « wear.

« There will be important savings due « to the reduced mileage to be dealt with, « a better definition of the elementary « work, and a reduction in the number « of immediate overhauls.

« 10. Recording vehicles, particularly « those which give the position of each « rail in the vertical and horizontal planes « and the gauge, give invaluable services « from this point of view, with regard to « the factors to which they are sensitive. « By the comparison of successive record- « ings they make it possible to follow the « evolution of the condition of a given « line.

« The use of recording vehicles is of « very great economical value, because it « permits the maintenance work to be « done exactly on the right spot and just « at the right moment, with consideration « to the track standard of the entire rail- « way system.

« 11. It should be recalled that this « question has already been considered « in Summary No. 5 *(a)*, of Question 1, « of the Enlarged Permanent Commission « which met at Lisbon on June 4, 1949, « in the following form :

« The maximum output of mechanis- « ed equipment for cleaning and « screening the ballast, and the removal « and replacement of the track, is « obtained when it is possible to take « advantage in long gaps in the running « of trains. This practice allows of a « speeding up of relaying operations, « of a reduction in the delay in carrying « them out in one section of track, in « short, to reduce the expense of all « services and particularly the expense « of slowing up traffic. »

« It is particularly important that the « planning of permanent way renewals « should be made in full agreement with « the Operating Department.

« 12. The final summaries adopted at « the Enlarged Meeting of the Permanent « Commission (Lisbon, June, 1949) men- « tion the paths for the movement of the « men and machines as follows :

« It is desirable in future in the case « of new railway construction or when « modifying existing lines to provide « large cesses to facilitate the use of « mechanical equipment and generating « plant.

« Besides this, the existence of such « paths is also very desirable for the « safety of the men, because in a large « measure they reduce the movement « of men to and from their place of « work on the track.

« It is equally desirable to maintain the « continuity of the « side paths » when « electrification is being carried out.

« 13. The factors in the evolution of « maintenance : concentration of gangs, « organisation of works and mechanis- « ation, are capable of yielding consider- « able economies as compared with « present methods. Nevertheless -

« the economic advantages of con- « centration decrease when high cost

« is involved in the transport or lodging « of a gang when the area is greater « than can be covered by the men on « foot;

« the potential economies of mechan- « isation fall when the volume of work « is small, or when traffic is consider- « able.

« 14. The general application of the « new methods will only be crowned with « success when the administrative staff « fully understand the possibilities and « limitations of these methods and how « to take full advantage of the economies « which it is hoped will result from their « application.

« 15. The replies received from the « various Administrations cover all the « methods applied to standard track « maintenance.

« Present progress in the technique of « the composition of the track (elimin- « ation of joints), and with regard to the « material used (notably an increase in « the life of sleepers) will allow, if present « hopes are realised, of effecting a con- « siderable reduction in recurring items « of maintenance. The labour strength « necessary for maintenance work proper « will certainly be reduced and new com- « position of length gangs will need to « be studied.

« The question of extraneous duties « (inspection and obligations in connec- « tion with level crossings in particular) « should form the subject of thorough « investigation because it will become « increasingly impossible to burden length « gangs with such work if their output « is not to be affected. »

QUESTION 2.

A. Modernisation of station buildings and methods employed in financing modernisation projects.

B. Standardisation of unit construction applied to railway buildings.

SUMMARIES.

A. Modernisation of station buildings and methods employed in financing modernisation projects.

« 1. A number of Administrations oper- « ating important railway systems take into « account in their modernisation projects « statistics of the anticipated volume of « traffic and revenue therefrom. Other « Administrations consider that certain « factors should not be overlooked, such « as :

« the necessity to cater for the require- « ments of present day traffic;

« the necessity to cater for the « requirements of estimated future traf- « fic;

« the possibility of realising econo- « mies in maintenance and operating « costs by means of improved planning « of station amenities;

« the necessity of making alterations « to buildings following alterations in « the general layout of the station.

« 2. In modernisation works, renewals, « maintenance and repairs, are in general « charged to revenue.

« 3. Very large projects are often carried « out in stages, each financed separately. « Wherever possible, expenditure is met « from revenue, working capital or renew-

« al and depreciation reserves; when « possible some Administrations employ « loan capital.

« 4. The annual maintenance and « renewal are in some cases calculated « on a uniform basis for all types of con- « struction, but some Administrations « differentiate between buildings with a « long expectation of life and those of a « more temporary construction.

« 5. Some Administrations take into « account the earnings from ancillary « services, but, except at large stations, « the amounts involved are not of great « importance. Nevertheless, there is « much to be said for exploiting to the « fullest extent the possibilities of earn- « ings from shops, restaurants, hotels, « advertising display, etc. In some cases « a portion of the money needed for « station reconstruction can come out of « revenue from ancillary services, or from « capital contributions made by tenants.

« 6. The contributions from public « authorities and local bodies to station « reconstruction or alteration schemes « are of limited extent, except when the « work is carried out directly for their « benefit. Only rarely has local pride, « allied to commercial instinct, seized the « opportunities offered in making a rail- « way station a civic building.

« It is desirable that the use of station « buildings as commercial centres and as « connecting points with local bus lines « should be studied in collaboration with « other interested parties. In big cities « this also applies to the utilisation of « station buildings as terminals for air- « ports, and, possibly, also the use of « stations as landing sites for helicopters « when the technical requirements are « better understood.

« 7. In the planning stages of recon- « struction schemes the general practice « is to try to make economies by taking « advantage of the most up-to-date equip- « ment and methods of working. It is « most important that the designers and « the using departments work in the « closest co-operation in order to obtain « the fullest benefits from saving in « personnel and improved working. »

B. Standardisation of unit construction applied to railway buildings.

« 1. For railway purposes standardised « unit construction appears to be the « answer to a need for simple structures « which can be quickly and economically « built, easely dismantled, and easily « enlarged or adapted. Its use has, on « the whole, been limited to buildings of « an industrial character, such as loco- « motive sheds, goods depots, platform « shelters, and to various types of small « buildings such as lengthmen's huts, « shelters, and small stores.

« 2. It appears to be the general view « that, at least as far as initial cost and « rapidity of construction are concerned, « standardised unit construction systems « have advantages, but the greatest advant- « age from standardisation in buildings « has been gained from the use of stand- « ard components, especially those in « general use in the building trade, « standard fittings and equipment.

« 3. For station buildings generally and « for non-industrial buildings the char- « acter of the countryside, climatic con- « ditions and local customs are taken into « account. Such buildings must not « become discordant factors in their « surroundings and nearly always need « to be specially designed.

« 4. It is likely that technical develop- « ments in the building industry will keep « step with the progress of prefabrication « systems.

« 5. The application of standard unit « construction does not need to destroy « initiative among technical staffs since « standards must be reviewed at due « intervals.

« Standardisation is also important in « that it effects economy in the time « employed in the design of structures. »

SECTION II. — Locomotives and rolling stock.

QUESTION 3.

Technical and economic investigation of the basic characteristics of electric traction systems now in use, with a view to decide whether, and to what extent, there are relevant reasons for preferring one system to another.

In particular, are there any reasons in regard to :

a) power supply;

b) overhead line and fixed track installations;

c) motive power units;

d) working and maintenance costs?

SUMMARIES.

General.

« 1. The investigations of the Reporters « show that for all practical purposes the « only systems suitable for extensive « railway application are :

« Direct Current, 1 500 V;

« Direct Current, 3 000 V;

« Alternating Current, low fre- « quency at 11/16 kV;

« Alternating Current, standard fre- « quency at about 25 kV.

« 2. Each of these systems has features « in the technical, operational, and econo- « mical fields which make one or other « of them particularly suitable in certain « circumstances.

« 3. They, however, each possess cer- « tain less advantageous features which « have to be taken into account when a « choice of system has to be made.

Power supply.

« 4. The power supply system does not « normally determine the choice of elec- « trification system as all can be arranged « for supply from systems feeding other « loads.

« 5. However, this enquiry has shown « that there is a wide disparity of tariffs « and further study of these and of the « possibility of more favourable rates

« being given to the railways is recom- « mended especially in view of the fact « that the supply systems benefit by the « supply of large amounts of power at « « off-peak » hours.

Fixed installations.

a) *Substations.*

« 6. D.C. systems require a greater « number and sometimes more complicat- « ed substations than are required for « A.C. systems.

« 7. Of the A.C. systems, the standard « frequency system permits the simplest « fixed installations because frequency « converters or special lines and low « frequency power stations are not re- « quired.

« 8. Until more evidence is available, « it must be feared that this simplicity « is accompanied by the inconvenience « due to the reaction of unbalancing « effects on the power supply and certain « restrictions on the possibility of accord- « ing parallel supplies to sections of the « railway.

(b) *Overhead contact lines.*

« 9. The A.C. systems permit the use « of smaller cross sections in the contact « system than are needed for the D.C. « systems; after allowance has been made « for the difference in line voltage, the « sub-station spacing, the average and « maximum values of drop of voltage are « of the same order for the two A.C. « systems.

« 10. The lower weight of the contact « line permits a reduction in the strength « of the supporting structures and their « foundations, but on account of restric- « tions imposed by wind forces and track « curvature, the spacing between struc- « tures is of the same order for all « systems.

« 11. There are wide diversities in the « amount of clearance reported necessary « on the various systems in different « countries, perhaps because of climatic « conditions and, in particular, because « certain Administrations consider it ne- « cessary to provide a large margin of « security.

« Further tests should be made to « determine the clearances necessary un- « der the various conditions which arise « in service.

« 12. The advantages of the light « weight overhead systems are most « pronounced on railways of simple form- « ation in open country and are of less « importance in built-up areas with « multiple tracks, many junctions and « difficulty in obtaining necessary clear- « ances.

« 13. Satisfactory overhead contact « systems can be built for all the systems.

Motive power units.

« 14. There is a marked trend towards « the total adhesion type of locomotive, « usually with bogie mounted motors, for « all systems.

« 15. Differences in the method of « rating and the type of service preclude « the possibility of exact comparison « between the characteristics of locomo- « tives working on one system of elec- « trification with those of another.

« 16. Satisfactory locomotives for « freight passenger and mixed traffic have « been built for all systems and there has « been a steady improvement in the quality « of performance of locomotives of all « types.

« It is now possible, with all systems, « to construct locomotives suitable for « all services.

« 17. The advent of the 50 cycle « system has led certain Administrations « to build several interesting types of « locomotives. Amongst these types, « those which use the single phase com- « mutator motor must be capable of « overcoming the traditional difficulty « of bad commutation inherent in this « type of motor; others which include « current conversion on the locomotive « should provide new possibilities in the « use of electric traction.

« Final judgment should, however, be « deferred until sufficient operating exper- « ience has been obtained.

« Locomotives converting A.C. to D.C. « hold out prospects of simplifying inter- « running between railways electrified on « different systems.

« 18. The multiple unit type of electric « train is an important feature of most « electrification schemes which cater for « passenger traffic, and it is considered « that there is still further scope for its « exploitation.

Economic investigation.

« 19. The widely differing conditions « which exist between countries make it « impossible to place any great reliance « on a direct comparison of the costs of « their respective systems.

« 20. As regards the comparison of « first costs between different systems, the « variation is not only very great as « between different countries but is affect- « ed to a certain extent by the diversity « in size and type of the respective « systems.

« 21. The information received regard- « ing maintenance and operating costs « has not permitted a conclusion about « the effect of the system in use on these « costs. This is probably because the « size, type and age of the installations, « particularly of the tractive units, which « affect the maintenance cost very con- « siderably, are so variable as to prevent « an effective comparison being made.

« 22. A great reduction in the first cost « of fixed equipment will favourably « affect the possibility of electrifying lines « which otherwise would not justify elec- « trification. This would seem to be a « big factor in favour of the 50 cycle « single phase system, but a more accur- « ate assessment of the advantages to be « derived could be made only if a com- « mon formula were devised for deter- « mining more realistic fixed charges for « different items of equipment.

« 23. It cannot be said at present at « what point this system would be prefer- « able to another for electrification of « lines which demand a greater number « of motive units and in which, therefore, « the first cost of fixed installations have « a relatively lower importance.

« 24. There seems to be insufficient « experience at present with the 50 cycle « system of electrification to assert a « definite superiority of any of the four

« main systems in all respects which « would permit any one to be preferred « over the others under conditions at « present obtaining.

« 25. The evidence at present available « suggests that it is unlikely that in the « foreseeable future one system will prove « to be the best for all railways having « regard to their very diverse charac- « teristics.

« 26. In any case, such superiority, « wherever it exists, is unlikely to be « sufficient to justify the cost of replacing « an existing system.

« 27. On most lines the choice between « systems can only be made by detailed « comparative estimates, taking all the « special factors of the lines concerned « into account. »

QUESTION 4.

Means and methods to improve the efficiency of steam locomotives :

a) increase of steam pressure,

b) types of grates,

c) superheating of the steam,

d) preheating of the feeding water,

e) feed water treatment, etc.

SUMMARIES.

« 1. Steam traction is being progress- « ively displaced by other types of « traction, and little new steam loco- « motive construction is now envisaged.

« In view of the size of the stock of « steam locomotives which will have to « remain in service for many years to « come, the main aim of the Administra- « tions is to reduce to a minimum the « cost of operation and to increase the « availability of engines by improved « efficiency of performance and especially « by simplification.

« It would appear that in the search « for a lower operating cost for steam « traction, in the present state of steam « locomotive technique, particular atten- « tion should be paid, without any « cessation of the search for technical « improvement in the motive unit, to « improving the organisation of the loco- « motive's service (operation and main- « tenance).

« 2. Although certain Administrations « have obtained satisfactory results, from « the point of view of maintenance, « with higher pressures, the majority of « the Administrations consider that, to « avoid any risk of increased cost of « maintenance, boiler pressure should « not exceed 18 kg/cm^2 (256 lbs per « sq. inch) and the temperature of the « superheat should not exceed 400° C.

« 3. Various types of grate (fixed or « movable) are used on all locomotives. « None of these types appears to be « particularly outstanding.

« 4. Mechanical stocking is well devel- « oped for powerful locomotives, even for « locomotives having a grate area of « less than 5 m^2 (53 sq. ft.). It is advisa- « ble in spite of the resultant expense. It « also allows fuel to be used which is « not very suitable for hand firing.

« Oil firing has been extended but its « development depends mainly on the « comparative economic market in fuel « oil and coal.

« 5. In spite of increased maintenance « costs, feed water preheating is widely « used.

« Mixer type, pump preheaters are « generally preferred to other types of « preheater.

« The combustion gas preheater is « capable of giving interesting results in « suitable conditions.

« 6. Feed water treatment is done either « in fixed plants (external treatment), or « in the boiler (internal treatment). Where « fixed plants are already in existence, « they may be used to reduce the cost of « internal treatment.

« Direct treatment of water in the boiler « is developing and is to be recommended. « It offers in general considerable advant- « ages as regards reduction in boiler « maintenance and repair, increased loco- « motive availability and reduced con- « sumption.

« 7. There is a tendency shown in « favour of boiler lagging. It is not yet « possible to give a decision for or « against the system.

« 8. No new tendency has been shown « in recent years with regard to the « various types of exhaust used on steam « locomotives. Variable exhausts tend « to disappear.

« 9. Cylindrical piston valves with « Walschaerts gear prevail, by reason of « their simplicity and ease of maintenance.

« Poppet valves are used only in « special cases.

« 10. Despite the thermodynamic advant- « ages which may result from the adop- « tion of compounding, there appears to « be a very clear tendency in favour of « simple expansion because of the greater « simplicity of the mechanism.

« 11. Air preheating, condensers and « thermic syphons are little used and in « all cases only in special circumstances.

« 12. Annual mileages of locomotives « have noticeably increased and fre- « quently attain 80 000 to 90 000 km « (49 700 to 56 000 miles). These results « are due both to the improvement in the « organisation of the service and the « improvements in the methods of main- « tenance of the locomotives. »

SECTION III. — Working.

QUESTION 5.

Radiophonic communications in railway working.

SUMMARIES.

A. — Introduction.

« 1. The potentialities of radio for « communications with and between mo- « bile units have been the main reason « for development of this form of com- « munication in some countries during « the last 10 years.

« 2. In addition, radio may under some « special circumstances be a cheaper and « more reliable alternative means of

« providing communication between fix-
« ed stations.

« 3. Technical advances in this relatively « modern method of communication « should receive the attention of Railway « Administrations.

B. — Communication with and on trains en route.

« 4. Radio-telephonic communication « with and on moving trains is used more « extensively in the U.S.A. than else-« where : the circumstances in which it « is used depend essentially on the « methods of operation.

« 5. Radio-telephony between trains « and fixed points is particularly suitable « for lines operated by « dispatching » and « train orders » : it assures a readily « available liaison between the train staff « and the dispatcher who may thus « co-ordinate movements more easily to « increase the efficiency of working and « prevent delays.

« In its present state of development, « however, radio-telephony between trains « and fixed points is unsuitable for con-« trolling train movements from the « safety point of view (except possibly « where traffic is light).

« 6. Radio-telephony between the front « and rear of trains can only be justified « when the regulations necessitate the « presence of a guard at the rear and « when the length of trains makes visual « communication difficult between guard « and driver.

« 7. When, for the reasons given above, « trains and train staff are provided with « radio equipment, it may be used :

« to assure communication between the « trains engine and the banking or « assisting engine to co-ordinate their « movements;

« to warn a train of possible danger;

« to warn the driver or guard of defects « found by a member of the train staff.

C. — Marshalling yards and large centres.

« 8. Radio-telephony is used in mar-« shalling yards :

« *(a)* Between some central supervisory « point such as a yardmaster's office and « locomotives in the yard.

« *(b)* Between the person in charge of « propelling movements over a hump and « the driver of a locomotive engaged on « humping operations.

« *(c)* Between inspectors, foremen or « shunters and drivers of locomotives « engaged on shunting operations in other « parts of the yard.

« *(d)* To and from wagon examiners « where speed is desirable in reporting « defective wagons or bad loads.

« *(e)* To and from checkers or num-« bertakers, where detailed recording of « the composition of trains is necessary.

« 9. Reliable radio communication can « lead to savings in locomotive and man « hours, reductions in the number and « gravity of mishaps, and a speed-up in « the clearance of sorting sidings. The « quicker passage of wagons through a « yard increases its capacity and might, « in some circumstances, obviate the « necessity for laying additional tracks « and for providing humping signals.

« 10. In large centres waste movement « and time can be avoided and greater « efficiency attained by employing radio « between a central supervisory point and « locomotives serving distant depots, « dock areas, factories, and other siding- « connected undertakings.

« 11. Radio-telephony may also facilitate the working at large passenger « stations by assuring close and readily « available liaison between the station « master and the signal boxes, on the one « hand, and the shunting engines on the « other.

« The use of transportable radio-telephony apparatus, giving communication between the front and rear of « empty train sets, can also facilitate the « carrying out of propelling movements.

« 12. Under conditions of poor visibility, even greater advantages are « secured.

D. — Engineering operations and ancillary services.

« 13. When radio-telephony is employed to link railway construction « gangs and maintenance gangs on track, « electrical overhead equipment and signalling, with engineering supervisors « and traffic department posts, closer « co-ordination and utilisation of men, « materials and equipment is possible.

« 14. Advantages are obtained by the « use of radio-telephony when clearing « lines in the case of accident, and for « controlling the movements of snow « ploughs, etc.

« 15. Although experiments have been « made, little evidence is forthcoming of « the application of radio-telephony to « the control of railway-owned road « collection and delivery vehicles. This « appears to be a field in which radio « could be employed to reduce mileage, « summon assistance in the event of « breakdowns or accidents, direct vehicles « to pick up urgent consignments, and « generally to give a better commercial « service.

« 16. The use of radio by railway police « has assisted in the prevention and « detection of thefts from railway vehicles « and premises.

« 17. The provision of a radio-telephone « service to connect passengers in the « trains to the public telephone system is « largely infuenced by the distances traversed by the trains and commercial « considerations.

E. — Communication between fixed points.

« 18. The use of radio for communication « between fixed points is worthy of « consideration where :

« *(a)* Distances relatively great have to « be covered involving the erection of « long stretches of aerial wires or laying « of cables.

« *(b)* Telephone lines are costly and « difficult to maintain owing to topographical or climatic conditions.

« *(c)* Communications are subject to « sabotage, to destruction or to damage « of all kinds.

« 19. Beamed radio using microwave « technique may be particularly advantageous for these conditions. While « these systems are expensive, they might

« be justified where there is a consider-
« able density of message traffic between
« any two particular stations.

F. — Licensing.

« 20. In all countries, licenses to
« operate radio stations have to be
« obtained from the appropriate autho-
« rity in control of the telecommunica-
« tion services of the country. Conse-
« quently the frequencies allotted and
« signal strength permitted to the railways
« govern the character of the service in
« which they can be employed and the
« method of their utilisation.

« 21. In some countries the licensing
« authorities have discouraged the use
« of radio for communication between
« fixed points, owing to the requirements
« of national and public services such as
« aviation, broadcasting, etc., for which
« no other form of communication but
« radio is practicable.

« 22. It is possible, however, that in
« such cases licensing authorities will
« look with greater favour on the intro-
« duction of microwave systems for fixed
« point-to-point communication in view
« of the greater number of channels avail-
« able, and the advantages gained by
« utilising beamed transmission to reduce
« interference with other radio services.

« 23. In general, the frequencies allotted
« to Railway Administrations are in the
« very high frequency band (VHF) or
« above. This, whilst limiting the range,
« minimises interference and enables the
« same frequencies to be employed simul-
« taneously in different localities.

G. — Apparatus.

« 24. Radio equipment for railway pur-
« poses must be robust and compact and
« in the case of mobile stations, water-
« proof.

« 25. Recently the size and weight of
« radio sets of all types have been reduc-
« ed, and developments in this direction
« should be encouraged. In this connec-
« tion two types of sets may be employed
« according to the conditions under which
« they are used :

« light individually portable sets, not
« exceeding approximately 2 kg in weight;

« transportable sets not exceeding 12 kg
« in weight which may be moved by one
« man.

« 26. Aerials on railway vehicles should
« be of a type which keep whithin the
« permitted structural gauge clearances
« and with which there is no risk of
« contact with high tension contact wires.

« The limitations imposed by the load-
« ing gauge have not had any serious
« effect on radio communications.

« 27. Continuity of radio signals in
« long tunnels, deep cuttings and valleys
« bounded by high mountains is only
« possible today by using special equip-
« ment. »

QUESTION 6.

A. — Remote operation of signal boxes: technical realisations, working orders.

B. — Electric working and control devices for hinged and « flexible » points and switches.

Control of accidental trailing of the switch blade.

SUMMARIES.

A. — Remote operation of signal boxes: technical realizations, working orders.

« 1. Remote control of signalling instal- « lations is becoming more and more « extended and is developing along two « distinct lines: *(a)* remote control of « stations, as a rule small ones, *situated « along a line* (C.T.C.); *(b)* remote « control of groups of points and signals « in large stations, situated in areas some « distance away, or of the equipment at « junctions and crossings between lines, « such control being effected from a « neighbouring station.

« 2. On *single* line, C.T.C. is being « applied in order to increase the capacity « and flexibility of the working on heavily « trafficked routes in order to avoid « having to double the line, or to effect « a reduction in the staff ordinarily on « duty at the stations. The results obtain- « ed under both these aspects depend « on the methods of working adopted in « the various countries and the conditions « obtaining previously on each line in « question.

« If these results are important on lines « operated by the dispatching system « with train order, they are generally « more reduced on other lines notably « when they are equipped with a dis- « patching system, and when the opera- « tion of points and signals is effected by « station staff from the station buildings.

« 3. C.T.C. is to be recommended on « *double lines* when it is a question of « adopting reversible working on each « track in order to obtain greater traffic « capacity, or to avoid having to lay « down additional lines. The best results « are obtained when the periods of maxi- « mum traffic load on the two tracks do « not coincide and the number of cases « of trains having to be put into a siding « for another to pass is large on account « of a number of trains following each « other at differing speeds.

« 4. Remote control applied to the « electric operation of points and signals « *individually or by route* locking in the « outer areas of large stations or at « nearby junctions, etc. allows of extend- « ing in an economic manner the radius « of action of signal boxes to cover very « considerable areas.

« The saving in first cost depends on « the balance obtained between the « reduction in the cost of cabling and « that of providing the remote control « equipment. This saving becomes more « noticeable as the number of items of « apparatus remotely controlled at each « location increases and as their distance « from the central controlling apparatus « becomes greater.

« Concentrating the remote control of « the operation of points and signals in « large areas allows of suppressing the « large number of staff otherwise requir- « ed. This gives rise to savings in staff « and greater capacity and flexibility of « working.

« 5. Lines or areas remotely controlled « are always provided with track circuit- « ing, or equivalent apparatus, such as « axle counters, to check up the occupa- « tion of the tracks and register the « movements of trains.

« Generally such installations are com-

« pleted by having automatic signalling « applied to them, taking advantage of « the presence of track circuiting.

« Only those signals which protect « points are habitually remotely con- « trolled as regards their absolute stop « indications.

« 6. The systems most generally used « for remote control transmission are « those employing D.C. impulses, which « can differ as regards the duration of the « impulses and cuttings or concerning the « polarity of the impulses.

« The so-called « time code » system « (code of short and long impulses) is the « one most used in C.T.C.

« The polarized impulse systems and « the induced impulse systems seem to « be preferred where rapidity of trans- « mission becomes an important factor.

« 7. Safety interlocking arrangements « in remotely controlled installations are « habitually effected at the subsidiary « lineside locations and are consequently « independent of the remote control « itself. In this way, any error or defect « in the transmission of a control or a « return indication has no effect on the « safety of the working.

« 8. The numerous relays used in « remote control installations are more « similar in type to telephone type relays « than to signalling relays, but an « endeavour is made to improve their « quality and characteristics by a finer « degree of manufacture, using improved « up-to-date processes and sometimes by « making them larger and more robust « than actual telephone relays.

« 9. These installations are widely used « in the United States. Nevertheless, « experience gained by most of the « managements concerned does not ap- « pear as yet to be sufficient by reason of « the small number of installations in use « and the short lengths of time they have « been in service, to enable any final « general conclusions to be reached as « to the preference to be accorded to this « or that way of carrying out a remote « control system, such as the number and « function of the transmitting wires « required, normal conditions of trans- « mission circuit — that is whether « normally energised or not — the use « of relay chains or rotary selectors in « parallel or in series, and the recording « and storing of controls and return « indications.

« 10. The capacity offered by remote « control systems and their flexibility « from the point of view of future exten- « sions fall to be considered under various « aspects :

« 1) the number of subsidiary locations « capable of being controlled along a « length of line; 2) the number of con- « trols and return indications available « for each such subsidiary location; « 3) capacity of the system and the line « circuits to transmit without delays « adversely affecting the flexibility of the « working, the number of controls and « return indications rendered necessary « by the density of the traffic and charac- « teristics of the remote control equip- « ment itself. This last consideration is « of great importance in areas where « there is heavy traffic and of such a « character as to indicate it as advisable « to adopt quicker working systems, or

« systems using more wires or trans-
« mission channels.

« 11. Some Railways allow for having « at remotely controlled locations on « heavy worked lines a local control « frame or « panel » either to control « local traffic operations after disconnect- « ing the remote control, or to enable the « locations to be worked locally when the « remote control is out of order.

« In the small stations, it is customary « to be satisfied with providing for local « operation of points on the ground, « either electrically or manually effected « according to the particular regulations « in force, either by the train crews or the « staff at the station.

« 12. The maintenance and upkeep of « remote control installations do not « appear to offer any special difficulties. « Failures of the equipment itself are « very few, thanks to the progress made « in their design and construction. The « tendency is to group relays together in « suitable assemblies in dustproof cases « with plug-in type connectors. This « enables any assembly to be replaced by « a spare one in a few seconds. The « period of regular overhaul of equip- « ment varies with the amount of work « each group of apparatus is required to « perform, according to the density of « the traffic.

B. — Electric working and control devices for hinged and « flexible » points and switches. Control of accidental trailing of the switch blade.

Point machines.

« 1. It is usual to adopt motors capable « of rotating in either direction as « required. Various types of mechanism « are used to convert the rotary into a « straight line movement; eccentrically « shaped cams, spur gear, rack drives « and worm and crank drives.

« The amount of movement, operating « stroke and force required differ, gener- « ally speaking, according to whether the « points are on main lines or subsidiary « lines, are trailable or non-trailable, « heel-less or heeled.

« 2. *Operating current.* — The current « used to operate the points is that « obtained in the most economic manner « in the particular locality, and continuity « of supply should generally be assured « for installations with heavy traffic. « Some of the electrified railways use any « convenient kind of current for the « point motors.

« 3. *Point detection circuits.* — All types « of current are accepted for use in con- « nection with point detection, but low « voltage D.C. appears to be the most « frequently used. Some Railways use « a type of current different from that « employed for traction purposes.

Point locking and bolting.

« 4. The general practice is to connect « the bolting or locking mechanism of « electrically worked points directly to « the operating portion, thus avoiding « having to have separate bolting arran- « gements. Opinions vary however as to « the way in which such bolting should « be effected. Certain Administrations « provide direct locking of the point « tongues to the stock rails with the aid « of a point tongue bolt, functioning with

« the operating mechanism of the points. « This bolt can be trailable or not according « ing to the practice of the particular « Administration respecting the trail- « ability of points. Other Administrations « bolt the operating rod or rods, or it « may be the point detector connecting « rods acting with the tongues, by means « of moving parts contained in the point « machine mechanism.

Point detection.

« 5. The most usual practice is to prove, « by means of an electrical contact maker « or circuit controller placed inside the « equipment :

« *(a)* that the point operating rod (or « the two rods where each tongue is « operated separately) has completed its « stroke; and

« *(b)* that these rods are held and « bolted by some interior mechanism « which is non-reversible.

« For points in main running lines « taken in the facing direction, most « Administrations complete these arran- « gements by an additional equipment « comprising contacts actuated directly « by the tongues themselves, in order to « make certain that the closed tongue is « effectively in place and tight home and « that the other tongue is open properly « at the correct distance. These point « tongue detecting contacts may be inside « or outside the point machine. Certain « Administrations use these additional « arrangements only in the case of points « taken facing at high speeds.

« These types of detection are found in « modern power signalling installations « under the form of « constant » detec- « tion giving permanent control over the « operation of the signals.

Local operation of points.

« 6. All modern electric point operating « arrangements allow of effecting when « desired local manual operation of « points on the ground by means of « either a crank handle or lever.

« As a rule, putting the handle in « position for manual operation interrupts « the feed to the machine. During such « manual operation, the detection which « indicates the position of the points in « the signal box and their agreement or « otherwise with the control line lever « there, continues to function.

« 7. Some Administrations find it « advantageous for traffic operating pur- « poses to install, in certain cases, local « individual electrical operation of the « points. Such local actuation requires « the permission of the central controlling « box or station before it can be put into « operation.

Protection against irregular action of point machines.

« 8. Special measures are taken to « make any irregular operation of point « machines practically impossible and to « exclude any false detection or return « indications.

« The principal arrangements that may « be adopted for this purpose are:

« use of wires and cables of high insul- « ating quality answering to very strict « specifications;

« frequent inspection and measurement « of the insulation resistance of a circuit « and use of « earth » detectors;

« suitable arrangement and design of « the electrical equipment and connec- « tions and wiring, both internal and « external, so rendering it impossible for « them to become altered or rendered « defective in the course of maintenance « work and testing;

« satisfactory arrangement of all con- « trol and detection circuits in such a « way as to reveal any defect in insulation « that can arise and prevent any possible « extraneous current from putting the « point machine in motion;

« use of suitable types of current in the « detection circuits according to the kind « of stray current that can be met with « in each case.

Accidental trailing through of points.

« 9. Opinions are divided on the « question of using trailable devices to « prevent damage to the points themselves « or to their electro-mechanical operating « mechanism. Some Administrations « limit their use to marshalling yard « tracks and certain subsidiary ones. On « the other hand, others make use of the « trailability feature for electrically oper- « ated points as a general practice on « main running lines, save, sometimes, in « the case of points with « flexible » « tongues.

« Some Administrations follow a kind « of middle course in this matter. On « main running lines, they give preference « to the non-trailable point machines, on « condition that there is a proper arran- « gement of fixed signals to protect the « points which require to be taken from « the trailing direction, but where such « signalling is not provided then trailable « equipment is adopted, which reduces « to the minimum interruptions to the « traffic and does not require the presence « of special staff to make good any « damage, such as results from trailing « through points in the wrong direction.

« 10. It is the usual practice to indicate « in the signal box when a pair of points « becomes trailed through, whether they « are actually of the trailable type or not, « by means of a visual indicator, often « supplemented by an audible indication. « On main running lines, it is recommend- « ed to make such detection of the « « constant » type.

« Certain Administrations use counters « to record the number of times points « are trailed.

« 11. In the case of trailable equipment « on main running lines the unbolting « of points which are being run through « is ordinarily brought about by the « action of the wheel on the open tongue, « the first of the two to become displaced « during such movement.

« In the case of points in marshalling « yard and secondary lines, simpler « apparatus can be used based on the « use of springs.

« 12. Non-trailable equipment is gene- « rally provided with some part which « becomes permanently deformed or « broken during trailing; this localises « the action and limits the resultant « damage. »

SECTION IV. — General.

QUESTION 7.

Modernisation of the methods to be adopted for recruiting the staff in number and qualification.

Harmonious renewal of the various ranks, indispensable reserve lists, ratio of the permanent and temporary staff.

Part played by the medical service in the recruiting.

SUMMARIES.

« 1. It is highly desirable to establish « a long term plan to ensure in a suitable « and harmonious manner, the recruit- « ment of administrative, technical and « supervisory staffs.

« This plan must meet any new situations « resulting from progress in working « methods (modernisation, rationalis- « ation, etc) and changes in social condi- « tions, and be so conceived that it will « not cause any lack of balance in the « constitution of the various ranks of « permanent staffs.

« 2. The objectives of this plan can be « attained by regular recruitment and by « suitable selection and training of a « sufficient number of staff to fill pros- « pective vacancies in administrative and « technical posts.

« 3. An establishment which includes « temporary employees should have their « number limited to those needed for « economical working.

« 4. Greater importance should be given « to the selection of staff in order to « ensure that the best of the applicants « are selected.

« The character, intellect and aptitude « of each applicant should receive special « attention.

« As far as possible the recruitment of « temporary staff should be done on « similar lines to those followed when « engaging permanent staff.

« 5. A proper method of selection « should include the following :

« *(a)* job specification — at least for « technical and supervisory staff and « skilled workers;

« *(b)* application form;

« *(c)* examination and competitive « examination;

« *(d)* interview;

« *(e)* psychological examination — at « least applied to staff concerned with « safety on the undertaking;

« *(f)* comprehensive medical examin- « ation.

« 6. It is desirable that where possible « there should be training of staff.

« Pre-appointment training is essential « at least for operating staffs.

« 7. Encouragement should be given « to the staff to attend, if possible, univer- « sities or technical schools outside work- « ing hours in suitable courses. Alterna- « tively arrangements might be made to « provide such technical training within « the undertaking.

« 8. Suitability should be the only « criterion in promotion of staff. It is « only when the qualifications of candi- « dates in this respect are equal that the « senior one should be appointed.

« 9. It is to be noted that while the « standard of fitness required on entry « into employment is very similar on « most undertakings, there are wide « divergencies of practice regarding per- « iodical medical examinations of em- « ployees.

« It would be advisable for the chief « medical officers of the various under- « takings to study, in common, practices « and standards in this matter. »

QUESTION 8.

Determination of the principles of geographical and functional organisation of a railway system. Simplification and retrenchment of the administration of railways.

SUMMARIES.

I. — Functional organisation.

« 1. The principles and particularities « of functional organisation on different « systems vary considerably as between « the different Railway Administrations.

« It does not seem to be possible to « make an *a priori* decision, based on « broad generally recognised principles of « organisation, that one fully elaborated « type of organisation for the whole of « a particular system whatever system « may be, is to be preferred to all others. « Only by detailed analysis of the applic- « ation of these principles in each parti- « cular case can an opinion be given on « the general solution which seems to be « most suitable.

« It also seems impossible to deduce, « by means of a methodical analysis of « the various forms of organisation « adopted by the various systems, that « one form of organisation is always and « incontestibly preferable to every other « form.

« Every form of organisation which has « in fact been adopted by a Railway « Administration has advantages and « disadvantages. The fact that a form « of organisation proves satisfactory to « a particular Administration cannot be « taken to imply that it can be recom- « mended to another Administration; the « advantages and disadvantages must be « weighed in each particular case.

« Because it is impossible to refer cases « to a single standard type or organisation « or even to a limited number of standard « types of organisation, a critical examin- « ation of a system's organisation can « only usefully be conducted by consider- « ing separately each group of activities « for which there is only a small number « of possible solutions in existence.

« The observations set out above on « the subject of the over-all organisation « of a system, apply equally well to « detailed organisation.

« 2. It is useful to distinguish in a « Railway Administration between four « general functions. These are :

« the higher control of the under- « taking, which belongs to the « own- « ership » level;

« the determining of general policy « and of the overall programme, which

« belongs to the « administrative » « level;

« the management of the system and « the working out of the programme « of execution, within the framework « of the general instructions received » from the previous level, which belongs « to the « management » level;

« the actual carrying out of that « programme, which belongs to the « « executive » level.

« Certain of the higher levels can be « amalgamated into one.

« Whatever may be the allocation of « duties between the different functions, « it is desirable that these functions should « be clearly defined and specifically alloc- « ated.

« 3. The decisions on the organisation « of a system which, it appears, have to « be considered the most carefully, are « concerned with the following questions :

« at « administrative » level :

« The determination of the powers to « be delegated to the General Manager « (or to the Managing Committee);

« at « management level » :

« Wether to integrate the Headquarters « Departments within the General Mana- « gement or to make them into an addi- « tional supervisory body;

« The grouping of activities at head- « quarters level, the number of chief « officers to report to the General Mana- « ger (or Managing Committee) and, « when occasion arises, the co-ordination « of Departments by the Assistant General « Managers and the separation of the « essential activities on the one hand the « sections concerned with special central- « ised work on the other;

« at the « executive » level :

« The number of intermediate super- « visory bodies between headquarters and « the local units;

« The choice between a « departmen- « tal » form of organisation and a « « divisional » form of organisation;

« The fixing of the respective duties of « the chief officers at headquarters and « the chief regional officers;

« The grouping of activities at each « « executive » level;

«The delegation of powers to be made « in respect of the different levels of the « organisation.

II. — Geographical organisation.

« 4. The particular forms of geogra- « phical organisation of railway systems « vary to a considerable extent between « the different Railway Administrations.

« 5. The boundaries of every geogra- « phical area and the place chosen for its « headquarters should meet the following « requirements, as far as possible :

« — they should allow for effective « control throughout the area in question;

« — they should reduce to a minimum « the difficulties of liaison with neigh- « bouring areas;

« — they should allow for easy contact « between the area headquarters and the « headquarters immediately superior to « it in the organisation;

« — they should make for easy contact « between the railway management on « the one hand and the customers as well « as the Public Authorities on the other.

III. — General recommendations.

« 6. So far as the geographical and « functional organisation of a system is « concerned, a Railway Administration « must make its choice between the diffe- « rent solutions according to its own « judgment of the relative disadvantages « and advantages of these solutions when « applied to its own particular case.

« 7. It is recommended that the follow- « ing general principles be applied in « respect of a system's organisation :

« *(a)* The number of regional levels « should be as small as possible;

« *(b)* At each level of the organisation, « the different activities to be carried out « must be clearly defined and allocated « with full regard to the importance of « essential activities;

« *(c)* Effective co-ordination must exist « at every level of the organisation;

« *(d)* Effective control of one level of « the organisation by the other must be « set up;

« *(e)* The number of subordinates « responsible to a single superior must « be limited to the maximum number « which is compatible with proper control;

« *(f)* Responsibility and authority « must be defined at every level of the « organisation in such a way that the one « always corresponds to the other.

« 8. A system's organisation must either « be under continual examination or « must be examined at sufficiently close « intervals for it to profit from every « simplification which may increase ad- « ministrative efficiency without increas- « ing general expenses and which may « reduce the administrative staff establish- « ment without impeding either the « smooth operation or the improvement « of the system. To this end, it is appro- « priate to consider such steps as :

« (1) Amalgamation or regrouping of « activities;

« (2) Abolition of intermediate levels « of authority;

« (3) The installation or abolition of « sections entrusted with special duties;

« (4) Decentralisation of powers and « of authority;

« (5) Improvement of administrative « methods of work, with special reference, « in this connection, to modern techni- « ques and particularly to mechanisation;

« (6) Revision of the geographical sec- « tions into which the area is divided and « the corresponding abolition of some « divisions;

« (7) Centralisation of certain work;

« (8) The abolition of unproductive « administrative work. »

QUESTION 9.

Railway participation in road transport undertakings.

SUMMARIES.

« 1. Transport technique is in a con- « stant state of evolution. For some « years, and more especially since the « end of the war, it has undergone deep- « reaching changes.

« 2. The railway should be treated like « any other undertaking or industry by « allowing it to make a wide use of the « road technique. The railway cannot be

« required to seek after every possible « way of reducing its costs and, at the « same time, to be obliged to limit its « adaptability both to modern techniques « and the needs of its clients.

« 3. It is agreed that the use of the « motor technique enables the railway :

« *(a)* to rationalise its working and « consequently reduce its costs;

« *(b)* to improve the quality of its « services by offering its clients a wider « and more complete range of facilities, « thereby maintaining and increasing its « traffic.

« 4. The railway may have to resort to « the road technique :

« *(a)* in the case of passenger traffic :

« — on routes parallel to the railway « (substituting bus services for railway « services, replacing trains by motor « services, taking over existing bus ser- « vices which run parallel to rail or the « commercial control thereof).

« — on non-parallel routes (cross coun- « try lines, supplementary or feeder ser- « vices);

« — to run tourist tours combining « rail and motor travel or even tours « making use of motor services through- « out;

« *(b)* in the case of freight traffic, for « the most diverse purposes, in particular :

« — collection and delivery services;

» — the transport of parcels traffic to « and from the centre stations;

« — the transport of wagon-conveying « trailers and rail-road trailers;

« — the transport of containers;

« — special transports including abnor- « mal indivisible loads;

« — the transport of full loads when « the railway services are replaced by « lorry services or even the transport « from one end of the journey to the « other, if such is considered to be the « most profitable.

« *(c)* In sparsely populated areas where « both rail and road passenger services « are provided the real needs of transport « should be studied with the object of « reducing costs by avoiding wasteful « duplication; serving the community « by the more economical and flexible « means whichever it may be. The same « conclusion applies equally well with « freight but here the criterion may well « prove to be the nature and the quan- « tity of the traffic rather than the density « of population.

« 5. The Railway, as a public transport « undertaking, must consider the use « of road services, separate or combined « with railway services, considering their « relative merits as regards total costs of « transport and quality of service to the « customers. The railways must be left « to decide in what cases these consider- « ations should lead to the use of motor « services.

« 6. When the railway considers it « « necessary or desirable » to make use « of the road technique, different methods « of operation should be used :

« *(a)* operate the road services directly « or under separate statutory organisation « (en régie);

« *(b)* have them operated by private « firms with which it has made a contract

« (charter contracts, renting of vehicles « or services, partnership agreements, « etc.);

« *(c)* or have them operated by under- « takings under its control (majority « share) which as a result are associated « undertakings of the railway, or merely « undertakings in which it has a financial « interest (minority share).

« The choice of method should depend « solely upon the economic factors involv- « ed.

« 7. It is desirable in principle to make « use of the method which will give the « railway commercial control of the ser- « vices, and at the same time guarantee « its contacts with its clients.

« 8. The operating of passenger road « services or freight services by affiliated « companies (majority share) ensures « great flexibility, and is justified by the « considerable differences which exist « between the two techniques (working « conditions, social conditions, etc.) and « the actual commercial atmosphere in « which road transport has its being. « With a statute similar to that granted « to any other road transport undertaking, « it is possible to make a clear distinction « as regards responsibility and adapt the « services perfectly to the needs of the « users whilst assuring that control of the « transport remains in the hands of the « railway. In addition, the subsidiary « company whilst operating its own ser- « vices, can also make use of the indirect « method of working by contract.

« The system of subsidiary companies, « allowing these to have a large measure « of self-government, is also that which « enables the railway to reap the greatest « advantages from the economic and « financial points of view, whilst at the « same time giving it a better chance to « hold its own against actual or potential « competition, to make sure of its proper « place in the present or future transport « market, and to safeguard its own traffic « and at the same time acquire further « outlets.

« The system of associated companies « is also that which fits in the best with « the idea of regional decentralisation.

« 9. The participation of the railway « in road transport undertakings by one « of the methods which assure that it « retains effective control whilst the opera- « ting autonomy of the road undertaking « is safeguarded, contributes to the idea « of organic coordination of overland « transport. It should be fitted into the « framework of a consistent and logical « general policy for the transport.

« 10. The railway should be given every « freedom to follow methodically the « extension of its road services and to « have recourse to that method of opera- « tion best suited to its needs; in particular « the setting up of associated companies, « either by taking shares in existing firms « or by buying them up, or by setting up « new firms.

« 11. Where such exist, legal or admi- « nistrative obstacles which hinder such « freedom should be done away with or « at least diminished. These obstacles « cannot be justified by the fear that the « railways will hinder the normal develop- « ment of road transport, the railways « demanding no monopoly and the exper- « ience of certain Shipping Companies

« resorting to air, has proved that there « was no foundation for this fear.

« It can neither be justified by the « possibility, in certain countries, of « increased financial burden to the State, « as the railway can, as a result of the « autonomy and regulations governing « their road transport undertakings, give « the required guarantees of the sound « financial footing of these undertakings.

« Where there are no such obstacles, it « is recommended to the railway mana- « gements to make free use of the facilities « they have, both for the present and the « future, in the interest of a more rational « and effective operation.

« 12. It is to be recommended that the « Administrations, in so far as they have « not already done so, to :

« *(a)* adopt a more resolute road « transport policy in all spheres where the « satisfying of the needs of the users and « the operational costs justify this solu- « tion;

« *(b)* set up together with their central « services a road transport service as « well as a co-ordination department, the « duties of which will be to study syste- « matically :

« — the advantages and bases on « which the road technique should be « used;

« — the possibilities of participation in « self-contained road transport under- « takings (operation by subsidiary com- « panies);

« — if there are no such possibilities, « other methods of road operation (oper- « ation under separate statutory organis- « ation [en régie], contracts, chartering or « renting vehicles or services, etc.);

« — the control of such participations « or other methods of road operation.

« These functions can, if need be, be « delegated to an affiliated company.

« *(c)* set up, by the Railway Administra- « tion, a separate balance sheet for its « investments in road services as well as « the operating results of such services « or the receipts from its participation in « self-contained affiliated companies.

« *(d)* conclude among themselves the « necessary agreements with a view to « co-ordinating the operation of their « international road services. »

SECTION V. — Light Railways and Colonial Railways.

QUESTION 10.

Wear of rails on curves:

(a) characteristics of track-laying on curve and details of the rolling stock liable to cause premature wear of the rails;

(b) running effects of locomotives and motor coaches with motor bogies;

(c) results of the investigations made and proposed remedies. Use of rail-lubrication processes.

SUMMARIES.

« 1. The characteristic form of wear on « a rail of the outer line of curved

« track is a chamfering of the inner « face of the head, the angle of which « varies between about 20° to 30° to the « centre of the rail. In addition, the « running surface is worn on a plane « sometimes slightly inclined towards the « centre of the track.

« The inner line of rail is subject to ver- « tical wear of the running surface, on a « plane almost parallel to it.

« The finish of surface is usually main- « tained. Binding is sometimes experienc- « ed, accompanied by the shedding of « flakes of metal.

« 2. The characteristics of track laying « considered to have the greatest influence « on wear of rails on curve are :

« curvature of the track; lateral wear « being appreciable in curves with radii « of less than 600 m. (656 yards) standard « gauge and 350 m. (383 yards) metre « gauge :

« — insufficient superelevation with lat- « eral wear of the outer rail; excessive « superelevation for vertical wear of the « inner rail;

« — steep down gradients;

« — excessive widening of the gauge;

« — insufficiently long parabolic curves.

« 3. The features of rolling stock which « have a predominant influence on the « wear of curved rails are principally « those which affect the angle of thrust of « the wheel on the rail; long rigid wheel- « base, or on the contrary an insufficiently « long wheelbase, total play of the axle « in the track, longitudinal or lateral play « of the axleboxes, lateral play of jour- « nals.

« Amongst other causes of wear may be « mentioned : the stiffness of some bogie « or bissel side control arrangements, « amount of unsprung masses, diameter « of wheels. Small diameter wheels cause « higher stresses and heavier hammer- « blows at rail gaps than wheels of large « diameter.

« 4. The effects of locomotives and « motor coaches with driving bogies are « the object of varying views. Whilst some « Administrations have not noticed any « harmful results, others consider them « to be particularly aggressive and to « produce lateral rail wear which is much « heavier than that caused by carrying « bogies or by certain long wheelbase « vehicles.

« These effects are attributed prin- « cipally :

« — to the amount of the axle load and « especially to the unsprung mass (parti- « cularly of nose-suspended traction mo- « tors);

« — to the increased rate of acceleration « and speed;

« — to asymmetrical motor couple.

« They show themselves particularly « in track irregularities.

« 5. As the factors which influence the « wear of rails in curves are numerous, « it is difficult to separate any one of them « from the whole. The quality of main- « tenance must also be taken into account.

« It is generally admitted that the lateral « wear of the outer rail in a curve of « radius R increases as a function of :

« the curvature, in a proportion which « appears to be between $\frac{K}{R}$ and $\frac{K}{R^2}$;

« the axle load and the speed of oper-
« ation;

« the angle of thrust of the axles.

« 6. The limits of lateral wear and that « on the running surface have been esta- « blished on the basis of experience, « taking into account the reduced strength « of the rail.

« It is only in exceptional cases that « chamfering of the worn head of the « outer rail has been admitted as a « decisive factor in derailments caused by « the flange mounting the rail.

« 7. To combat wear of rails in curves, « the following methods are adopted :

« — alteration of widening of the « gauge, and modification of the super- « elevation;

« — use of rails with a high resistance « to wear;

« — lubrication of rails.

« On several Railways, the life of rails « is extended where one lateral face of « the head is worn by reversing them end « to end, by changing them over to the « other line of rail, or by relaying them « in tracks of less importance.

« It appears that reversing the rails « end to end is of least interest.

« 8. The degree of gauge-widening given « to track has been reduced on some lines, « with the aim of lowering the angle of « thrust and reducing oscillation, as far « as compatible with the free inscription « of vehicles in the curve. Attempts have « been made to achieve a closer relation- « ship between superelevation and oper- « ating speeds.

« 9. A check rail is sometimes laid along « the inner rail of certain particularly « sharp curves to increase safety. The « check rail has, however, the drawbacks « of causing supplementary wear on the « inner surface of tyres and increasing « the resistance to movement.

« 10. Rails of steel with a high degree « of resistance to wear are used by some « Railways in low radius curves of lines « with heavy traffic : naturally-hard rails of « a single grade of steel usually manga- « nese — composite steel rails in which « only the portion of the head subject to « wear is of hard steel — heat-treated « rails (sorbitic or martensitic).

« These rails give a greatly increased « life, 2 to 5 times that of ordinary quality « steel.

« The higher price of rails with a high « proportion of manganese and of bi- « metallic rails, the brittleness of the « former particularly in low temperatures, « together with heat-treated rails, how- « ever, prevent their use being extended.

« 11. Lubrification of the inner face of « the head on the outer line of rail is at « present used by numerous Railways.

« Manual lubrication, limited to spe- « cial cases because of the labour cost « involved, must be carefully done to « avoid the spread of oil on to the run- « ning surface.

« Several types of fixed lubricators and « equipment mounted on motive units or « trailer vehicles provide a satisfactory « regularity of operation.

« The use of lubricators fixed to the « rail at the entrance to curves, worked « by the passage of each wheel, is particul- « arly justified on isolated curves of low

« radius, or where the curves are relat- « ively few in number.

« These lubrificators having to clear « the gauge of the electro-magnetic brakes, « it follows that it would be useful to « have this gauge defined.

« Equipment fitted to motive units or « trailer vehicles, either lubricating the « rails directly or the wheel tyres, are more « economical than the above on lines « which include fairly numerous curves. « This lubrication can be continuous on « very sinuous lines, but is usually autom- « atically restricted to the entrance to « low radius curves.

« Rail lubrication provides a very effi- « cient means of reducing not only their « lateral wear, but also tyre wear. The « life of rails is, in certain cases, almost « doubled. »

QUESTION 11.

Protection of overhead lines, substations, locomotives and motor coaches against accidents of electric nature (excess voltage, overloads, short circuits and lightning).

SUMMARIES.

Protection of high-tension distribution systems.

« 1. The relay types of current manu- « facture assure an acceptable protection.

« 2. *(a)* The protection of each point of « distribution, including traction substa- « tions, is recommended.

« *(b)* In order to obtain an adequate « protection of the installations, the « protection should include overcurrent « relays, combined with earth fault relays; « in this respect, relays of the differential « type are not sufficient.

Protection of static transformers.

« 3. The ideal protection against over- « loads and short circuits consists of a « group of two devices which control the « tripping of the primary circuit breaker:

« *(a)* by an instantaneous overcurrent « element;

« *(b)* by a device which includes an « element whose temperature would pro- « duce *that of the hottest spot of the* « *windings.*

« The protection against overloads of « converter units being such as to amply « cover that of transformers, it is possible « to dispense with protection of trans- « formers themselves.

« 4. Theoretically, it is the « thermal « image » which assures the most adequate « protection against excessive heating.

« 5. Overcurrent time delay relays « assure an acceptable protection for all « practical purposes. Thermal relays of « this type do not present any marked « advantage.

« 6. For oil immersed transformers, the « use of contact thermometers measuring « the oil temperature or thermostats gives « a supplementary protection.

« 7. No H.T. surge arrestor offers a « completely reliable protection. Their « installation is not indispensable, espe- « cially when other devices *ad hoc* exist « (earth wires on overhead distribution « lines, shock coils on transformer wind- « ings).

« 8. There is a general tendency towards « the use of the Buchholz relay as a « protective device against internal dam- « age to oil immersed transformers.

« 9. It is logical to install a protective « device in the air stream of the air « cooled transformers.

Protection of static converters.

« 10. For converters with several va- « cuum enclosures of relatively small « capacity, *complete* protection against « overloads and short circuits (external « and internal) is assured by the com- « bination of :

« *(a)* overcurrent relays actuating the « unit H.T. circuit breaker;

« *(b)* high-rupturing capacity anode « fuses or high speed overcurrent anode « relays;

« *(c)* an individual overcurrent cathode « relay for each converter. This will be « arranged to trip the unit H.T. circuit « breaker and disconnect the converter « from the D.C. bus bars.

« 11. *(a)* For converters of higher « capacity and with a single vacuum « enclosure, it is recommended, for the « protection against overloads and short « circuits, to use the H.T. circuit breaker « with time delay and instantaneous « overcurrent devices;

« *(b)* Anode fuses are little used with « steel tank rectifiers;

« *(c)* Where no anode fuses are « installed, a high-speed reverse-current « circuit breaker is necessary, if there is « a possibility of back-fire;

« *(d)* Arc-suppression equipment seems « to be recommendable for tensions of « 1 to 1.5 kV or more, or if high power « units are involved.

« 12. In order to protect steel tank « rectifiers against excessive heating, ther- « mostats are currently used. They « either:

« *(a)* give a warning signal;

« *(b)* actuate or control the cooling « system (air or water), or

« *(c)* shut down the unit.

« These thermostats are necessary where- « ever no other protective devices against « overload exist.

« 13. The most rational protective « device against a failure in the cooling « system controls the circulation of the « cooling medium (water or air).

« 14. The protections against ignition « or excitation failure are: the shutting « down, at least temporary, of the rectifier « unit; however, for attended substations, « an alarm system is sufficient.

« 15. For converters with continuous « pumping, some Administrations provide « a protective device against loss of « vacuum. In attended substations, « however, an alarm system may be « sufficient.

« 16. A surge arrestor is generally « installed on each anode.

« 17. Automatic voltage control is « little or rarely practised because of « complexity.

Protection of contact lines and of their power supply feeders.

« 18. As a protective measure against

« overloads, high-speed circuit-breakers « are generally used on D.C. systems. On « A.C. traction systems, the tendency is « to reduce the duration of short circuits « to a minimum by the adoption of « circuit breakers which are faster than « those used on the transmission lines.

« 19. The protection of contact lines « against voltage surges is a matter of « local circumstances.

« The tendency is to use an electronic « surge arrestor or condenser.

« 20. The disadvantages of the parallel « operation of substations can be taken « care of by means of a combination « between the characteristics of the cir- « cuit breakers in the substations and in « the switching stations.

Protection of electric motor vehicles.

« 21. On D.C. systems of 1.5 kV and « less, ordinary circuit breakers can be « used for the protection against over- « loads and short circuits, and fuses can « also be used.

« On D.C. systems of $\pm$ 3 kV, high- « speed circuit breakers, controlled by « overload relays, are used. Differential « relays are extensively used.

« 22. On D.C. systems the protection « against voltage surges, when provided, « is in general realised by means of « devices with condensers and sometimes « with semi-conducting material.

« 23. On powerful units, and especially « for D.C. tensions of the order of 1.5 kV « and more, a no-volt tripping is normally « provided.

Regenerative braking.

« 24. The protection should conform to « the following essential conditions:

« *(a)* A safe and efficient alternative « means of braking must be available « under all circumstances. This braking « must come into operation *in a very « short time*, should the possibility of « regenerative braking disappear;

« *(b)* Over-voltage must be prevented.»

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SCHREIBER. — La conversion des ateliers de locomotives de Bischheim en **ateliers d'autorails.** (3 000 mots & fig.)

1953 **625** .242 (44)
Revue générale des Chemins de fer, août, p. 470.
Le **nouveau matériel de la Société de Gérance des Wagons de grande capacité.** (1 000 mots & fig.)

1953 **621** .431 .72 (44)
Revue générale des Chemins de fer, septembre, p. 481.
DESPOUY (M.). — Les **autorails** de 600 ch. (type unifié) de la S.N.C.F. (3 500 mots & fig.)

1953 **621** .33 (44) & **625** .1 (44)
Revue générale des Chemins de fer, septembre, p. 493.
GUERIN et PERROUSSET. — Les **travaux de mise au gabarit « Electrification »** des ouvrages d'art des lignes du nord-est de la France. (4 500 mots & fig.)

1953 **625** .244 (44)
Revue générale des Chemins de fer, septembre, p. 515.
CHEVALLIER. — L'évolution du **glaçage des wagons réfrigérants.** (4 500 mots & fig.)

1953 **625** .144 .1 (44)
Revue générale des Chemins de fer, octobre, p. 529.
LÉVI (R.). — Les **longs rails soudés.** Extension de leur usage en France. (4 000 mots & fig.)

1953 **621** .132 .6 (81)
Revue générale des Chemins de fer, octobre, p. 539.
CHAPELON (A.). — **Locomotives à vapeur** construites par le Groupement d'Exportation de Locomotives GELSA pour les Chemins de fer du Brésil. (9 000 mots & fig.)

1953 **621** .331 (64)
Revue générale des Chemins de fer, octobre, p. 565.
DAUMAS. — Les **nouvelles sous-stations à 3 300 V** des Chemins de fer du Maroc dans la région de Casablanca. (3 000 mots & fig.)

Travaux. (Paris.)

1953 **62** (01
Travaux, avril, p. 233.
PROT (M.). — **La détermination rationnelle et le contrôle des coefficients de sécurité.** (5 000 mots, tableaux & fig.)

1953 **624** .2 & **691**
Travaux, avril, p. 245; mai, p. 273; juin, p. 329; juillet, p. 354.
GUYON (Y.). — Etude expérimentale de **poutres continues en béton précontraint.** (12 000 mots, tableaux & fig.)

1953 **656** .213 (65)
Travaux, avril, p. 255.
LARRAS (J.). — Le projet de la **nouvelle gare maritime** du port d'Alger. (2 000 mots & fig.)

1953 **691**
Travaux, mai, p. 297.
SAILLARD (Y.). — Le **procédé de précontrainte « Dywidag ».** Application de la construction des ponts en encorbellement. Ponts de Worms et de Karlstadt. (3 000 mots & fig.)

La Vie du Rail. (Paris.)

1953 **656** .212 .5 (73)
La Vie du Rail, 18 mai, p. 6.
CORNET (L.). — Une **gare de triage moderne** aux U.S.A. (800 mots & fig.)

1953 **625** .173 (44)
La Vie du Rail, 8 juin, p. 3.
Sur un **chantier mécanisé de renouvellement de voie** (entre Creil et Amiens). (1 000 mots & fig.)

1953 **625** .42 (944)
La Vie du Rail, 15 juin, p. 8.
Le nouveau **chemin de fer souterrain** de Sydney. (1 200 mots & fig.)

1953 **385** (09.3 (54)
La Vie du Rail, 22 juin, p. 3.
Aux Indes, le plus grand réseau des chemins de fer d'Asie fête son centenaire. (1 500 mots & fig.)

1953 **625** .2 (01
La Vie du Rail, 22 juin, p. 6.
Le **wagon dérailleur.** (500 mots & fig.)

1953 **385** (07 .2 (44)
La Vie du Rail, 13 juillet, p. 3.
COHEN (G.). — Les **laboratoires** de la S.N.C.F. (1 500 mots & fig.)

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1953 **621** .33 (43) & **625** .1 (43)
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BURGER. — **Bauafgaben anlässlich der Elektrifizierung** Stuttgart-Heidelberg-Mannheim. (1 800 Wörter & Abb.)

1953 **624** (43)
Der Eisenbahningenieur, Mai, S. 104.
HENNINGS (W.). — Eine **interessante Brückenhebung.** (300 Wörter & Abb.)

1953 **621** .135.2 (43) & **625** .212 (43)
Der Eisenbahningenieur, Mai, S. 105.
BEILFUSS (S.). — Rationalisierungsmassnahmen in der **Behandlung des Lagerweissmetalls** in den Werkstätten der Deutschen Bundesbahn. (2500 Wörter & Abb.)

1953 **621** .332
Der Eisenbahningenieur, Mai, S. 118.
FRIES (R.). — **Neue Arbeitsmethode bei der Herstellung von Fahrleitungsanlagen.** (1 500 Wörter & Abb.)

1953 **625** .173 (44)
Der Eisenbahningenieur, Juni, S. 121.
PRÜSS (W.). — **Mechanisierte Gleis-Grossbaustelle** Pinneberg im Hamburger S-Bahnverkehr. (5 000 Wörter & Abb.)

1953 **656** .211.7 (43)
Der Eisenbahningenieur, Juni, S. 134.
PÖPPLOW (H.). — Die **Ladeanlagen der Eisenbahnfähre Grossenbrode.** (1 500 Wörter & Abb.)

1953 **621** .332 (43)
Der Eisenbahningenieur, Juni, S. 138.
MEISTER (E.P.). — Die **Stromversorgungsanlagen** der Hamburger S-Bahn. (4 000 Wörter & Abb.)

Eisenbahntechnik. (Berlin.)

1953 **621** .335
Eisenbahntechnik, Heft 3, Juli, S. 103.
KREUTER (E.). — **Elektrische Lokomotiven** für Vollbahnen und Industriebahnen. (4 000 Wörter & Abb.)

1953 **621** .332
Eisenbahntechnik, Heft 3, Juli, S. 115.
Die **Rückwirkung von Einphasenwechselstrom-Bahnen mit 50 Hz auf das Energieversorgungsnetz.** (1 000 Wörter & Abb.)

E.T.R. Eisenbahntechnische Rundschau. (Köln-Darmstadt.)

1953 **656** .211.7 (43 + 489)
Eisenbahntechnische Rundschau, Mai, S. 177.
FLEMMING (F.). — Das **Eisenbahn-Hochsee-Fährschiff** « Deutschland ». (7 000 Wörter & Abb.)

1953 **656** .211.7 (43 + 489)
Eisenbahntechnische Rundschau, Mai, S. 195.
CIESIELSKI (H.). — Besonderheiten beim Bau der Brücken und des Fährbettes für die **Eisenbahn-Fährverbindung** Grossenbrode-Gedser. (3 500 Wörter & Abb.)

1953 **625** .232 (43)
Eisenbahntechnische Rundschau, Mai, S. 206.
LEICHER (E.). — **Neue Bauformen im deutschen Speisewagen- und Schlafwagen-Betrieb.** (3 000 Wörter & Abb.)

1953 **625** .212
Eisenbahntechnische Rundschau, Mai, S. 213.
MENGLER (E.). — Die **Härtung von Spurkränzen** an Schienenfahrzeugen. (2 200 Wörter & Abb.)

1953 **625** .28 & **656**
Eisenbahntechnische Rundschau, Juni-Juli, S. 222.
PIRATH (C.). — Die **Verkehrstechnik im Spiegel der Verkehrswirtschaft während der letzten 25 Jahre.** (16 000 Wörter & Abb.)

1953 **625** .285 (43)
Eisenbahntechnische Rundschau, Juni-Juli, S. 244.
LEICHER (E.). — Die neuen **Leichtmetall-Glieder-Triebzüge.** (14 000 Wörter & Abb.)

1953 **621** .431.72 (43)
Eisenbahntechnische Rundschau, Juni-Juli, S. 275.
LAMPE (C.) & GÖSSL (N.). — Die **2000-PS-Diesel-Lokomotive** der Deutschen Bundesbahn. (8 000 Wörter & Abb.)

1953 **625** .232 (43)
Eisenbahntechnische Rundschau, Juni-Juli, S. 289.
MIELICH (A.). — Neue Wagen für den **Fernverkehr der Deutschen Bundesbahn.** (7 500 Wörter & Abb.)

1953 **625** .232 (45)
Eisenbahntechnische Rundschau, Juni-Juli, S. 311.
ALBRECHT (W.). — Das **Schienenfahrzeug** im Dienste der Deutschen Bundespost. (8 000 Wörter & Abb.)

Elektrische Bahnen. (München.)

1953 **621** .332
Elektrische Bahnen, Mai, S. 97.
KRIENITZ (G.). — Die **Streckenkuppelstellen in Einphasen-Wechselstrom-Fahrleitungsnetzen,** ihre Schaltung, schutztechnische Ausführung und energiewirtschaftliche Bedeutung. (5 000 Wörter & Abb.)

1953 **621** .135.4 & **625** .215
Elektrische Bahnen, Mai, S. 105.
HEUMANN (H.). — **Grundzüge der Führung der Schienenfahrzeuge.** *(Schluss.)* (7 000 Wörter & Abb.)

1953 **621** .33
Elektrische Bahnen, Mai, S. 117.
BUCKEL (R.). — Ein **Halbwellenmesser für 16 2/3 Hz.** (1 000 Wörter & Abb.)

1953 **621** .335 (43)
Elektrische Bahnen, Juni, S. 123.
KILB (E.), SANDNER (F.) & WIRTH (Th.). — Die neue **elektrische Bo'Bo'-Lokomotive E10.001** der Deutschen Bundesbahn. (10 000 Wörter & Abb.)

1953 **621** .337
Elektrische Bahnen, Juni, S. 141.
HEGNAUER (W.). — **Beanspruchungen des Alsthom-Antriebes** bei elektrischen Lokomotiven. (3 000 Wörter & Abb.)

1953 **621** .335 (43)
Elektrische Bahnen, Juni, S. 147.
HEUMANN (E.). — Die **Mittelstelzenstützung der Lokomotive E 10.001** der Deutschen Bundesbahn. (3 000 Wörter & Abb.)

1953 **625** .255 : **625** .42 (43)
Elektrische Bahnen, Juni, S. 151.
KNIFFLER (A.). — Die **elektrische Bremsung** der Triebzüge auf der Hamburger S-Bahn. (1 500 Wörter & Abb.)

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1953 **625** .234
Glasers Annalen, Mai, S. 102.
BAUR. — Das englische Versuchs- und Vorführungsmodell eines **klimatisierten Eisenbahn-Reisezugwagens.** (3 000 Wörter & Abb.)

1953 **621** .135.4 & **625** .215
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Dr.-Ing. BÄSELER. — **Gleiskrümmung,** die grosse Täuschung. (1 500 Wörter)

1953 **385** (06.4 (43)
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LEHMANN & PFLUG. — Die **Fahrzeuge der Deutschen Bundesbahn** auf der **Deutschen Verkehrsausstellung München 1953.** (30 000 Wörter, Tafeln & Abb.)

1953 **625** .2
Glasers Annalen, Juni-Juli, S. 173.
BODE (A.). — Konstruktive und fertigungstechnische Erfahrungen bei dem **Bau eines Schlafwagen-Gliedertriebzuges aus Leichtmetall.** (3 000 Wörter & Abb.)

1953 **621** .431.72
Glasers Annalen, Juni-Juli, S. 178.
MÖLBERT (F.). — Neue Wege für die Ausbildung von **Maschinenanlagen, Getrieben und Laufwerken leichter Gliedertriebzüge.** (5 000 Wörter & Abb.)

1953 **625** .233
Glasers Annalen, Juni-Juli, S. 192.
BAUR (H.). — Die **Beleuchtung** der Leichtmetall-Gliedertriebzüge. (2 000 Wörter & Abb.)

1953 **625** .234
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BAUR (H.). — Die **Klimaanlagen** der Leichtmetall-Gliedertriebzüge. (6 000 Wörter & Abb.)

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1953 **656** (4)
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Dr. AUTENRIETH. — **Voraussetzungen und Aufgaben einer europäischen Verkehrsgemeinschaft.** (Bonnefous-, Van-de-Kieft- und Lemaire-Plan.) (5 000 Wörter.)

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OTTMANN (K.). — **Transportpolitik im Wechsel der Wirtschaftssysteme.** (6 000 Wörter & Abb.)

1953 **385** .1 & **656** .234
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KOLATH (H.-H.). — Der **Einfluss der Personentarifpolitik auf die Rentabilität des Eisenbahnverkehrs.** (2 000 Wörter & Tabellen.)

In English.

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1953 **721** .5
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The partial reconstruction of London Bridge station oof in light alloy. (1 400 words & figs.)

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1953 **621** .338 (73)
Electrical Engineering, April, p. 352.
BINGHAM (S.H.). — **Trends in rapid-transit car** lesign. (2 700 words & figs.)

1953 **621** .3 (73)
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WAGNER (C.F.), WITZKE (R.L.), BECK (E.) and TEAGUE (W.L.). — **Insulation co-ordination.** (4 000 words & figs.)

1953 **625** .233 & **625** .245
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HOFFER (A.H.) & WEBER (G.W.). — **An axle-driven alternator-rectifier system for caboose power supply.** (2 400 words and figs.)

The Engineer. (London.)

1953 **621** .431.72 (42)
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Standard diesel-electric shunting locomotives. (1 000 words & figs.)

1953 **385** .4 (42)
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Decentralisation of British Railways administration. (2 300 words & figs.)

1953 **621** .131.1 (42)
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NOCK (O.S.). — **Present-day locomotive working in Great Britain.** (8 600 words & figs.)

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1953 **621** .431.72 (42)
Engineering, June 12, p. 756.
Diesel-electric shunting locomotives for British Railways. (1 400 words & figs.)

1953 **656** .25 (42)
Engineering, July 10, p. 53.
Automatic train control ou British Railways. (2 600 words.)

1953 **656** .211.7 (42)
Engineering, July 10, p. 55.
Car-Ferry terminal at Dover. (900 words & figs.)

1953 **621** .33 (492)
Engineering, July 17, p. 65.
Electric locomotives of American design for the Netherlands Railways. (2 000 words & figs.)

1953 **621** .31
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JUDD (S.-R.). — **Arc suppression on mercury-arc rectifiers.** (2 400 words and figs.)

1953 **621** .431.72 (944)
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1953 **656** .2 (42)
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1953 **621** .132.1 (45)
The Locomotive, June, p. 80.
The Franco-Crosti boiler. (1 800 words & figs.)

1953 **625** .2 (42)
The Locomotive, July, p. 101.
LYNES (L.). — **Reflections.** *(To be continued.)* (2 000 words & figs.)

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Light alloy railway rolling stock. (1 200 words & figs.)

1953 **621** .33 (45)
Modern Transport, May 23, p. 10.
High-speed electric trains for Italy. (1 400 words & figs.)

1953 **656** .2 (68)
Modern Transport, May 30, p. 32.
HECKROODT (W.). — **Transport progress in South Africa.** — 2. Development of the condensing locomotive. (600 words & figs.)

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1953 **625** .28 (43)
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Road-rail bus for German railways. (750 words & figs.)

1953 **621** .431.72 (42)
The Oil Engine and Gas Turbine, July, p. 90.
British Railways' latest standard shunter. (1 200 words & figs.)

1953 **621**. 431.72 (44)
The Oil Engine and Gas Turbine, July, p. 91.
French Railways' new standard locomotives. (1 100 words & figs.)

The Overseas Engineer. (London.)

1953 **621** .33 (42) & **625** .232 (42)
The Overseas Engineer, July, p. 421.
Operational economy with aluminium trains. (900 words & figs.)

1953 **621** .338 (42)
The Overseas Engineer, August, p. 11.
Experimental street cars. (700 words & figs.)

1953 **656** .211.7 (42)
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New terminal at Dover. (1 100 words and figs.)

1953 **621** .33
The Overseas Engineer, October, p. 102.
COOPER (B.K.). — **Motive power for 50-cycle traction.** (1 000 words & figs.)

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1953 **691**
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MURDOCK (L.J.). — **The control of concrete quality.** (28 pages with figs.)

The Proceedings of the Institution of Electrical Engineers. (London.)

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The Proceedings of the Institution of Electrical Engineers, July, p. 133.
CROMPTON (O.J.) and WALLACE (G.A.). — **Economic aspects of overhead equipment for D.C. railway electrification.** (11 000 words & figs.)

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GALLAGHER (J.S.). — « **Piggy Backs** » - **Good or Bad**? (1 800 words & figs.)

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Railway Age, April 20, p. 86.
1952 a year of... **coal-burning turbine progress.** (1 000 words & figs.)

1953 **625** .214 (73)
Railway Age, May 4, p. 54.
What are the causes of hot boxes? (3 200 words & figs.)

1953 **656** (42)
Railway Age, May 4, p. 60.
SCHMIDT (W.H.) Jr. — **Is Britain freeing rails... to fight freed trucks?** (3 600 words & figs.)

1953 **625** .232
Railway Age, May 18, p. 129.
What's ahead in equipment? A review of current developments in lightweight design and their possible future effects on railroad passenger car specifications. (1 800 words & fig.)

1953 **625** .232 (73)
Railway Age, June 1, p. 59.
Budd's : New lure for passengers. (2 000 words & figs.)

1953 **625** .214 (73)
Railway Age, June 15, p. 103.
N. & W. demonstrates how... hot boxes can be controlled. (4 500 words & figs.)

1953 **656** .254 (73)
Railway Age, June 29, p. 56.
SAL adapts C.T.C. to 10 trains. (1 800 words & figs.)

1953 **625** .214
Railway Age, July 27, p. 51.
How Santa Fe reduces hot boxes. (1 900 words & figs.)

1953 **656** .254 (73)
Railway Age, August 10, p. 84.
Operations of five yards... coordinated by radio. (1 200 words & figs.)

1953 **625** .143.1
Railway Age, August 10, p. 90.
CODE (C.J.). — **What weight of rail?** (1 800 words & figs.)

1953 **656** .257 (73)
Railway Age, August 24, p. 65.
C.T.C. saves minute per mile... on 217 miles of single track. (1 100 words & figs.)

1953 **625** .172 (73)
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On the IHB at Blue Island... **This rip track cuts delays.** (400 words and figs.)

1953 **625** .244 (73)
Railway Age, Sept. 7, p. 93.
Temperatures stay below zero. (1 000 words & figs.)

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HUNT (G.W.). — **Selecting a rail section.** (2 000 words and figs.)

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Where will the gas turbine go? (1 700 words & figs.)

The Railway Gazette. (London.)

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ailway Gazette, May 15, p. 562.
Energy consumption for trains movement. — Compa-ative tests with London Transport light alloy and steel ock on District Line. (1 400 words & figs.)

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ailway Gazette, May 15, p. 564.
Multiple-unit trains in Brazil. (1 800 words & figs.)

1953 **621** .33 (493)
ailway Gazette, May 15, p. 567.
Belgian two-car high-speed electric trains. (400 words & figs.)

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ailway Gazette, May 15, p. 568.
South African Railways « 25 NC » class locomotives. 500 words & figs.)

1953 **625** .19 (42)
ailway Gazette, May 22, p. 590.
SLEE (J.P.). — **Repairing unusual slips on Western Main Line.** — I-II. (4 400 words & figs.)

1953 **625** .24 (43)
ailway Gazette, May 22, p. 597.
New German Federal Railways rolling stock. (600 words & figs.)

1953 **621** .33 (44) & **656** .254 (44)
ailway Gazette, May 29, p. 619.
Signalling for French 50-cycle electrification. (500 words.)

1953 **625** .232 (943)
ailway Gazette, June 5, p. 648.
Air-conditioned train for Queensland. (1600 words & figs.)

1953 **621** .33 (45)
ailway Gazette, June 12, p. 675.
Italian de Luxe electric trains. (3 500 words & figs.)

1953 **621** .431.72 (42)
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B.R. Standard 0-6-0 Diesel-Electric shunting locomotive. (2 000 words & figs.)

1953 **625** .244
ailway Gazette, June 19, p. 706.
PURDOM (W.). — **International transport of refrigerated goods.** (600 words & figs.)

1953 **385** (42)
ailway Gazette, June 26, p. 730.
British Transport Commission results for 1952. (3 300 words & figs.)

1953 **656** .254 (73)
ailway Gazette, June 26, p. 734.
Automatic controls at new U.S. marshalling yard. (2 500 words & figs.)

1953 **621** .133.1 (01 (42)
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POULTNEY (E.C.). — **Locomotive boiler performance.** (3 000 words & figs.)

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Modernisation of the Spanish National Railways. (1 700 words & figs.)

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Railway Gazette, July 10, p. 41.
GRANT (J.C.). — **Electric traction systems, Present and Future** — 1. *(To be continued.)* (3 000 words & figs.)

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Ministry of Transport Accident Report. — Etterby Junction, August 16, 1952: London Midland Region, British Railways (1 400 words & figs.)

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Railway Gazette, July 17, p. 66.
Development of lightweight high-speed train design. (800 words & figs.)

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Coal-fired gas turbine for locomotives. (500 words.)

1953 **625** .17 (42)
Railway Gazette, July, 17, p. 71.
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1953 **656** .251 (494)
Railway Gazette, July 24, p. 96.
Signalling on the Swiss South-Eastern Railway. (2 400 words & figs.)

1953 **625** .213
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Rolling stock shock absorbers. (900 words and figs.)

1953 **621** .431.72 (94)
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Diesel locomotives for Australia. (900 words & figs.)

1953 **621** .33
Railway Gazette, July 31, p. 124.
Electrification through the Pennines — 1. (1 400 words & figs.)

1953 **625** .245 (6)
Railway Gazette, July 31, p. 126.
Nigerian Railway mobile instruction unit. (1 600 words and figs.)

1953 **621** .431.72 (42)
Railway Gazette, July 31, p. 130.
Diesel shunters at Parkeston Quay, Eastern Region. (450 words and figs.)

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A Railway Gazette Publication. (London.)

1953 **621** .431.72 (73)
Diesel Railway Traction, July, p. 149.
New standard shunters British Railways. (1 600 words and figs.)

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Diesel Railway Traction, July, p. 157.
Narrow-gauge locomotives in Germany. (900 words & figs.)

1953 **621** .431.72 (489)
Diesel Railway Traction, July, p. 160.
Diesel development, Danish State Railways. (2 200 words & figs.)

Railway Locomotives and Cars. (New York.)

1953 **625** .214 (73)
Railway Locomotives and Cars, May, p. 53.
PINNEY (M.A.). — **Where, and how often do hot boxes occur?** (4 600 words & tables.)

1953 **625** .212 (73)
Railway Locomotives and Cars, May, p. 61.
Graphite molds turn out steel wheels of uniform structures. (2 600 words & figs.)

1953 **621** .431.72 (73)
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ROSS (A.) and MARTIN (R.J.). — **Army road switchers present unusual design problems.** (1 800 words and figs.)

1953 **625** .243 (73)
Railway Locomotives and Cars, June, p. 78.
Airslide covered hopper car. (800 words and figs.)

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ASSELBERGHS (H.). — Breve resumen de la historia del **Museo de Ferrocarriles Holandès.** (1 000 palabras & fig.)

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